

APPENDIX G

Indicative Surface Water Management Strategy and MicroDrainage Calculations



- NOTES
1. DO NOT SCALE FROM THIS DRAWING. WORK FROM FIGURED DIMENSIONS ONLY.
 2. ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN METRES.
 3. CULVERTED DITCH LEVELS HAVE BEEN INTERPOLATED FROM SURVEY UNDERTAKEN BY LIGHTSOURCE SURVEYS LTD IN APRIL 2018
 4. PROPOSALS ARE INDICATIVE ONLY TO DEMONSTRATE DRAINAGE STRATEGY AND ARE SUBJECT TO EVOLVE THROUGH DETAILED DESIGN
 5. THE LEVELS SHOWN ON THIS DRAWING ARE PRELIMINARY AND SUBJECT TO CHANGE.
 6. LIGHTING DESIGN IS INDICATIVE AND SUBJECT TO CHANGE AT DETAILED DESIGN.

- LEGEND
- SITE BOUNDARY
 - PROPOSED FOUL SEWER & MANHOLE
 - PROPOSED SURFACE WATER SEWER & MANHOLE
 - VORTEX FLOW CONTROL
 - PROPOSED PERMEABLE PAVING
 - PROPOSED HEADWALL
 - INDICATIVE ATTENUATION BASIN
 - BASIN EARTHWORKS EXTENT
 - INDICATIVE SWALE

FOR PLANNING PURPOSES ONLY

A		UPDATED TO CLIENT COMMENTS	NA	JH	SG	15.12.20
A		Author/Comments	Drawn	Checked	Approved	Date
 ODYSSEY Trading House White Hart Lane Basingstoke RG21 4AF Telephone: 01256 351144 Fax: 01256 351144 Email: info@odysseycontrol.co.uk Website: www.odysseycontrol.co.uk						
Job Title HORTON HEATH, EASTLEIGH						
Drawing Title DRAINAGE STRATEGY						
Client EASTLEIGH BOROUGH COUNCIL						
Scale 1:500 @A0	Date NOV 20	Designed NA				
Drawn JA	Checked JW	Approved JH				
Job No 19-367	Drawing No 19-367/001	Rev A				

P:\19-367 - Horton Heath, Eastleigh\Tech\Acad\Drawings\000 Series\19-367-001 Preliminary Engineering Layout.dwg

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	19.900	Add Flow / Climate Change (%)	0
Ratio R	0.350	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	1.414	4-8	1.040

Total Area Contributing (ha) = 2.454

Total Pipe Volume (m³) = 45.831

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	40.587	0.338	120.0	0.119	4.00	0.0	0.600	o	300	Pipe/Conduit	
S1.001	25.643	0.154	167.0	0.168	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.002	8.304	0.073	113.8	0.055	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.003	31.868	0.878	36.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	4.47	24.500	0.119	0.0	0.0	0.0	1.43	101.4	16.1
S1.001	50.00	4.82	24.162	0.287	0.0	0.0	0.0	1.21	85.8	38.9
S1.002	50.00	4.92	24.008	0.342	0.0	0.0	0.0	1.47	104.1	46.3
S1.003	50.00	5.12	23.935	0.342	0.0	0.0	0.0	2.62	185.0	46.3

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S5.000	20.356	0.136	150.0	0.016	4.00	0.0	0.600	o	150	Pipe/Conduit	
S5.001	16.440	0.110	150.0	0.011	0.00	0.0	0.600	o	150	Pipe/Conduit	
S5.002	15.744	0.183	86.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S5.003	48.654	1.478	32.9	0.035	0.00	0.0	0.600	o	150	Pipe/Conduit	
S5.004	27.487	0.325	84.6	0.072	0.00	0.0	0.600	o	225	Pipe/Conduit	
S5.005	54.568	0.775	70.4	0.265	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.012	70.733	0.700	101.0	1.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S5.000	50.00	4.41	23.906	0.016	0.0	0.0	0.0	0.82	14.5	2.2
S5.001	50.00	4.75	23.770	0.027	0.0	0.0	0.0	0.82	14.5	3.7
S5.002	50.00	4.99	23.661	0.027	0.0	0.0	0.0	1.08	19.2	3.7
S5.003	50.00	5.45	23.478	0.062	0.0	0.0	0.0	1.76	31.1	8.4
S5.004	50.00	5.77	21.925	0.134	0.0	0.0	0.0	1.42	56.6	18.1
S5.005	50.00	6.36	21.600	0.399	0.0	0.0	0.0	1.56	62.0	54.0
S1.012	50.00	7.65	20.600	2.454	0.0	0.0	0.0	1.56	110.6<	332.3

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S1	26.000	1.500	Open Manhole	1200	S1.000	24.500	300				
S2	25.960	1.798	Open Manhole	1200	S1.001	24.162	300	S1.000	24.162	300	
S3	25.660	1.652	Open Manhole	1200	S1.002	24.008	300	S1.001	24.008	300	
S4	25.530	1.595	Open Manhole	1200	S1.003	23.935	300	S1.002	23.935	300	
S5	26.570	1.350	Open Manhole	1200	S2.000	25.220	150				
S6	25.500	1.425	Open Manhole	1200	S2.001	24.075	225	S2.000	24.150	150	
S7	25.120	1.425	Open Manhole	1200	S2.002	23.695	225	S2.001	23.695	225	
S8	24.950	1.425	Open Manhole	1200	S2.003	23.525	225	S2.002	23.525	225	
S5	24.720	1.737	Open Manhole	1350	S1.004	22.983	375	S1.003	23.058	300	
								S2.003	23.133	225	
S6	24.400	1.737	Open Manhole	1350	S1.005	22.663	375	S1.004	22.663	375	
S7	24.180	1.737	Open Manhole	1350	S1.006	22.443	375	S1.005	22.443	375	
S12	24.200	0.800	Open Manhole	1200	S3.000	23.400	225				
S13	24.100	0.760	Open Manhole	1200	S3.001	23.340	225	S3.000	23.340	225	
S8	23.670	1.737	Open Manhole	1350	S1.007	21.933	375	S1.006	21.933	375	
								S3.001	22.083	225	
S9	22.950	1.737	Open Manhole	1350	S1.008	21.213	375	S1.007	21.213	375	
S16	22.800	0.800	Open Manhole	1200	S4.000	22.000	225				
S17	22.770	0.794	Open Manhole	1200	S4.001	21.976	225	S4.000	21.976	225	
S10	22.740	1.737	Open Manhole	1350	S1.009	21.003	375	S1.008	21.003	375	
								S4.001	21.153	225	
S11	22.600	1.812	Open Manhole	1350	S1.010	20.788	450	S1.009	20.863	375	
S12	22.610	1.909	Open Manhole	1350	S1.011	20.701	450	S1.010	20.701	450	
S21	25.256	1.350	Open Manhole	1200	S5.000	23.906	150				
S22	25.560	1.789	Open Manhole	1200	S5.001	23.770	150	S5.000	23.770	150	
S23	25.629	1.969	Open Manhole	1200	S5.002	23.661	150	S5.001	23.661	150	
S24	24.828	1.350	Open Manhole	1200	S5.003	23.478	150	S5.002	23.478	150	
S25	23.350	1.425	Open Manhole	1200	S5.004	21.925	225	S5.003	22.000	150	
S26	22.500	0.900	Open Manhole	1200	S5.005	21.600	225	S5.004	21.600	225	
S13	21.600	1.000	Open Manhole	1350	S1.012	20.600	300	S1.011	20.600	450	
								S5.005	20.825	225	
S	20.300	0.400	Open Manhole	0		OUTFALL		S1.012	19.900	300	150

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Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1	448968.087	116188.874	448968.087	116188.874	Required	
S2	448988.565	116223.916	448988.565	116223.916	Required	
S3	449000.622	116246.547	449000.622	116246.547	Required	
S4	448993.375	116250.601	448993.375	116250.601	Required	
S5	449078.021	116230.968	449078.021	116230.968	Required	
S6	449067.137	116251.551	449067.137	116251.551	Required	
S7	449047.734	116261.836	449047.734	116261.836	Required	
S8	449031.330	116265.933	449031.330	116265.933	Required	
S5	449009.624	116278.015	449009.624	116278.015	Required	
S6	449017.409	116292.046	449017.409	116292.046	Required	
S7	449023.687	116308.215	449023.687	116308.215	Required	
S12	449076.056	116305.735	449076.056	116305.735	Required	
S13	449067.426	116310.664	449067.426	116310.664	Required	
S8	449036.172	116328.513	449036.172	116328.513	Required	
S9	449054.673	116360.598	449054.673	116360.598	Required	

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Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S16	449066.690	116370.795	449066.690	116370.795	Required	
S17	449063.134	116370.755	449063.134	116370.755	Required	
S10	449056.066	116370.819	449056.066	116370.819	Required	
S11	449056.098	116384.723	449056.098	116384.723	Required	
S12	449066.588	116409.712	449066.588	116409.712	Required	
S21	449131.816	116327.692	449131.816	116327.692	Required	
S22	449141.616	116345.534	449141.616	116345.534	Required	
S23	449149.058	116360.193	449149.058	116360.193	Required	
S24	449144.224	116375.177	449144.224	116375.177	Required	
S25	449099.208	116393.637	449099.208	116393.637	Required	
S26	449109.638	116419.069	449109.638	116419.069	Required	
S13	449061.635	116445.019	449061.635	116445.019	Required	
S	448995.104	116469.033			No Entry	

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	300	S1	26.000	24.500	1.200	Open Manhole	1200
S1.001	o	300	S2	25.960	24.162	1.498	Open Manhole	1200
S1.002	o	300	S3	25.660	24.008	1.352	Open Manhole	1200
S1.003	o	300	S4	25.530	23.935	1.295	Open Manhole	1200
S2.000	o	150	S5	26.570	25.220	1.200	Open Manhole	1200
S2.001	o	225	S6	25.500	24.075	1.200	Open Manhole	1200
S2.002	o	225	S7	25.120	23.695	1.200	Open Manhole	1200
S2.003	o	225	S8	24.950	23.525	1.200	Open Manhole	1200
S1.004	o	375	S5	24.720	22.983	1.362	Open Manhole	1350
S1.005	o	375	S6	24.400	22.663	1.362	Open Manhole	1350
S1.006	o	375	S7	24.180	22.443	1.362	Open Manhole	1350
S3.000	o	225	S12	24.200	23.400	0.575	Open Manhole	1200
S3.001	o	225	S13	24.100	23.340	0.535	Open Manhole	1200
S1.007	o	375	S8	23.670	21.933	1.362	Open Manhole	1350
S1.008	o	375	S9	22.950	21.213	1.362	Open Manhole	1350
S4.000	o	225	S16	22.800	22.000	0.575	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	40.587	120.0	S2	25.960	24.162	1.498	Open Manhole	1200
S1.001	25.643	167.0	S3	25.660	24.008	1.352	Open Manhole	1200
S1.002	8.304	113.8	S4	25.530	23.935	1.295	Open Manhole	1200
S1.003	31.868	36.3	S5	24.720	23.058	1.362	Open Manhole	1350
S2.000	23.284	21.8	S6	25.500	24.150	1.200	Open Manhole	1200
S2.001	21.960	57.8	S7	25.120	23.695	1.200	Open Manhole	1200
S2.002	16.908	99.5	S8	24.950	23.525	1.200	Open Manhole	1200
S2.003	24.842	63.3	S5	24.720	23.133	1.362	Open Manhole	1350
S1.004	16.046	50.1	S6	24.400	22.663	1.362	Open Manhole	1350
S1.005	17.345	78.8	S7	24.180	22.443	1.362	Open Manhole	1350
S1.006	23.830	46.7	S8	23.670	21.933	1.362	Open Manhole	1350
S3.000	9.939	167.0	S13	24.100	23.340	0.535	Open Manhole	1200
S3.001	35.991	28.6	S8	23.670	22.083	1.362	Open Manhole	1350
S1.007	37.037	51.4	S9	22.950	21.213	1.362	Open Manhole	1350
S1.008	10.316	49.1	S10	22.740	21.003	1.362	Open Manhole	1350
S4.000	3.556	150.0	S17	22.770	21.976	0.569	Open Manhole	1200

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S4.001	o	225	S17	22.770	21.976	0.569	Open Manhole	1200
S1.009	o	375	S10	22.740	21.003	1.362	Open Manhole	1350
S1.010	o	450	S11	22.600	20.788	1.362	Open Manhole	1350
S1.011	o	450	S12	22.610	20.701	1.459	Open Manhole	1350
S5.000	o	150	S21	25.256	23.906	1.200	Open Manhole	1200
S5.001	o	150	S22	25.560	23.770	1.639	Open Manhole	1200
S5.002	o	150	S23	25.629	23.661	1.819	Open Manhole	1200
S5.003	o	150	S24	24.828	23.478	1.200	Open Manhole	1200
S5.004	o	225	S25	23.350	21.925	1.200	Open Manhole	1200
S5.005	o	225	S26	22.500	21.600	0.675	Open Manhole	1200
S1.012	o	300	S13	21.600	20.600	0.700	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S4.001	7.069	8.6	S10	22.740	21.153	1.362	Open Manhole	1350
S1.009	13.903	99.3	S11	22.600	20.863	1.362	Open Manhole	1350
S1.010	27.102	313.0	S12	22.610	20.701	1.459	Open Manhole	1350
S1.011	35.652	353.0	S13	21.600	20.600	0.550	Open Manhole	1350
S5.000	20.356	150.0	S22	25.560	23.770	1.639	Open Manhole	1200
S5.001	16.440	150.0	S23	25.629	23.661	1.819	Open Manhole	1200
S5.002	15.744	86.0	S24	24.828	23.478	1.200	Open Manhole	1200
S5.003	48.654	32.9	S25	23.350	22.000	1.200	Open Manhole	1200
S5.004	27.487	84.6	S26	22.500	21.600	0.675	Open Manhole	1200
S5.005	54.568	70.4	S13	21.600	20.825	0.550	Open Manhole	1350
S1.012	70.733	101.0	S	20.300	19.900	0.100	Open Manhole	0

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.119	0.119	0.119
1.001	-	-	100	0.168	0.168	0.168
1.002	-	-	100	0.055	0.055	0.055
1.003	-	-	100	0.000	0.000	0.000
2.000	-	-	100	0.026	0.026	0.026
2.001	-	-	100	0.022	0.022	0.022
2.002	-	-	100	0.057	0.057	0.057
2.003	-	-	100	0.037	0.037	0.037
1.004	-	-	100	0.055	0.055	0.055
1.005	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.047	0.047	0.047
3.000	-	-	100	0.117	0.117	0.117
3.001	-	-	100	0.000	0.000	0.000
1.007	-	-	100	0.097	0.097	0.097
1.008	-	-	100	0.062	0.062	0.062
4.000	-	-	100	0.155	0.155	0.155
4.001	-	-	100	0.000	0.000	0.000
1.009	-	-	100	0.000	0.000	0.000
1.010	-	-	100	0.012	0.012	0.012
1.011	-	-	100	0.026	0.026	0.026
5.000	-	-	100	0.016	0.016	0.016
5.001	-	-	100	0.011	0.011	0.011
5.002	-	-	100	0.000	0.000	0.000
5.003	-	-	100	0.035	0.035	0.035
5.004	-	-	100	0.072	0.072	0.072
5.005	-	-	100	0.265	0.265	0.265
1.012	-	-	100	1.000	1.000	1.000
				Total	Total	Total
				2.454	2.454	2.454

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
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S1.012	S	20.300	19.900	0.000	0	0
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Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1
Number of Input Hydrographs	0	Number of Offline Controls	0
Number of Online Controls	4	Number of Storage Structures	4

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Simulation Criteria for Storm

Number of Time/Area Diagrams 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.900	Storm Duration (mins)	30
Ratio R	0.350		

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: S13, DS/PN: S3.001, Volume (m³): 1.2

Unit Reference MD-SHE-0137-8000-0560-8000
Design Head (m) 0.560
Design Flow (l/s) 8.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 137
Invert Level (m) 23.340
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.560	8.0
Flush-Flo™	0.216	8.0
Kick-Flo®	0.424	7.0
Mean Flow over Head Range	-	6.5

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.0	1.200	11.4	3.000	17.7	7.000	26.6
0.200	8.0	1.400	12.3	3.500	19.1	7.500	27.5
0.300	7.8	1.600	13.1	4.000	20.3	8.000	28.4
0.400	7.3	1.800	13.9	4.500	21.5	8.500	29.3
0.500	7.6	2.000	14.6	5.000	22.6	9.000	30.2
0.600	8.3	2.200	15.3	5.500	23.7	9.500	31.0
0.800	9.5	2.400	15.9	6.000	24.6		
1.000	10.5	2.600	16.5	6.500	25.6		

Hydro-Brake® Optimum Manhole: S17, DS/PN: S4.001, Volume (m³): 1.0

Unit Reference MD-SHE-0209-2100-0524-2100
Design Head (m) 0.524
Design Flow (l/s) 21.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 209
Invert Level (m) 21.976
Minimum Outlet Pipe Diameter (mm) 225
Suggested Manhole Diameter (mm) 1200

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Tuscany House White Hart Lane Basingstoke RG21 4AF	ONE HORTON HEATH BASIN J																																																																									
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<u>Hydro-Brake® Optimum Manhole: S17, DS/PN: S4.001, Volume (m³): 1.0</u>																																																																										
<table><tr><td>Control Points</td><td>Head (m)</td><td>Flow (l/s)</td></tr><tr><td>Design Point (Calculated)</td><td>0.524</td><td>21.0</td></tr><tr><td>Flush-Flo™</td><td>0.293</td><td>21.0</td></tr><tr><td>Kick-Flo®</td><td>0.448</td><td>19.5</td></tr><tr><td>Mean Flow over Head Range</td><td>-</td><td>15.8</td></tr></table>			Control Points	Head (m)	Flow (l/s)	Design Point (Calculated)	0.524	21.0	Flush-Flo™	0.293	21.0	Kick-Flo®	0.448	19.5	Mean Flow over Head Range	-	15.8																																																									
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Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)																																																																			
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Storage Structures for Storm

Porous Car Park Manhole: S12, DS/PN: S3.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	20.0
Membrane Percolation (mm/hr)	1000	Length (m)	40.1
Max Percolation (l/s)	222.8	Slope (1:X)	40.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	23.400	Membrane Depth (mm)	0

Porous Car Park Manhole: S16, DS/PN: S4.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	17.1
Membrane Percolation (mm/hr)	1000	Length (m)	80.0
Max Percolation (l/s)	380.0	Slope (1:X)	40.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	22.000	Membrane Depth (mm)	0

Tank or Pond Manhole: S26, DS/PN: S5.005

Invert Level (m) 21.600

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	280.0	0.900	592.0

Tank or Pond Manhole: S13, DS/PN: S1.012

Invert Level (m) 20.600

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	919.0	1.000	1624.0

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	19.900	Add Flow / Climate Change (%)	0
Ratio R	0.350	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.405	4-8	1.058	8-12	0.062

Total Area Contributing (ha) = 1.526

Total Pipe Volume (m³) = 77.938

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	22.797	0.250	91.2	0.023	4.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	19.510	0.500	39.0	0.020	0.00	0.0	0.600	o	150	Pipe/Conduit	
S2.000	11.397	0.076	150.0	0.044	4.00	0.0	0.600	o	150	Pipe/Conduit	
S2.001	30.322	0.202	150.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	4.36	23.300	0.023	0.0	0.0	0.0	1.05	18.6	3.1
S1.001	50.00	4.56	23.050	0.043	0.0	0.0	0.0	1.62	28.6	5.8
S2.000	50.00	4.23	23.630	0.044	0.0	0.0	0.0	0.82	14.5	6.0
S2.001	50.00	4.85	23.554	0.044	0.0	0.0	0.0	0.82	14.5	6.0

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.008	49.622	0.124	400.2	0.132	0.00	0.0	0.600	o	525	Pipe/Conduit	
S1.009	58.552	0.101	579.7	0.143	0.00	0.0	0.600	o	525	Pipe/Conduit	
S1.010	24.688	0.700	35.3	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.008	50.00	8.82	19.125	1.383	0.0	0.0	0.0	1.11	241.0	187.3
S1.009	50.00	9.88	19.001	1.526	0.0	0.0	0.0	0.92	199.8	206.6
S1.010	50.00	10.01	18.900	1.526	0.0	0.0	0.0	3.06	337.9	206.6

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S1	24.650	1.350	Open Manhole	1200	S1.000	23.300	150				
S2	24.400	1.350	Open Manhole	1200	S1.001	23.050	150	S1.000	23.050	150	
S3	24.680	1.050	Open Manhole	1200	S2.000	23.630	150				
S4	24.550	0.996	Open Manhole	1200	S2.001	23.554	150	S2.000	23.554	150	
S5	24.230	0.878	Open Manhole	1200	S2.002	23.352	150	S2.001	23.352	150	
S6	23.950	0.800	Open Manhole	1200	S2.003	23.150	150	S2.002	23.150	150	
S3	23.900	1.425	Open Manhole	1200	S1.002	22.475	225	S1.001	22.550	150	
								S2.003	22.550	150	
S4	23.100	1.425	Open Manhole	1200	S1.003	21.675	225	S1.002	21.675	225	
S5	22.750	1.500	Open Manhole	1200	S1.004	21.250	300	S1.003	21.325	225	
S6	22.600	1.607	Open Manhole	1200	S1.005	20.993	300	S1.004	20.993	300	
S11	22.960	1.500	Open Manhole	1200	S3.000	21.460	300				
S12	22.600	1.500	Open Manhole	1200	S3.001	21.100	300	S3.000	21.100	300	
S13	21.890	1.575	Open Manhole	1350	S3.002	20.315	375	S3.001	20.390	300	
S7	21.550	1.850	Open Manhole	1350	S1.006	19.700	450	S1.005	19.850	300	
								S3.002	19.775	375	
S8	21.300	1.774	Open Manhole	1350	S1.007	19.526	450	S1.006	19.526	450	
S16	22.890	1.425	Open Manhole	1200	S4.000	21.465	225				
S17	22.580	1.575	Open Manhole	1350	S4.001	21.005	375	S4.000	21.155	225	
S18	22.100	1.575	Open Manhole	1350	S4.002	20.525	375	S4.001	20.525	375	
S19	21.850	1.575	Open Manhole	1350	S4.003	20.275	375	S4.002	20.275	375	
S20	21.680	1.575	Open Manhole	1350	S4.004	20.105	375	S4.003	20.105	375	
S21	21.280	1.650	Open Manhole	1350	S4.005	19.630	450	S4.004	19.705	375	
S9	20.950	1.825	Open Manhole	1500	S1.008	19.125	525	S1.007	19.200	450	
								S4.005	19.200	450	
S10	21.150	2.149	Open Manhole	1500	S1.009	19.001	525	S1.008	19.001	525	
S11	20.100	1.200	Open Manhole	1500	S1.010	18.900	375	S1.009	18.900	525	
S	18.800	0.600	Open Manhole	0		OUTFALL		S1.010	18.200	375	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1	449008.038	116287.947	449008.038	116287.947	Required	
S2	449019.154	116307.850	449019.154	116307.850	Required	

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Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S18	448889.321	116385.498	448889.321	116385.498	Required	
S19	448881.742	116398.436	448881.742	116398.436	Required	
S20	448882.734	116406.779	448882.734	116406.779	Required	
S21	448896.297	116437.081	448896.297	116437.081	Required	
S9	448907.926	116467.214	448907.926	116467.214	Required	
S10	448862.345	116486.826	448862.345	116486.826	Required	
S11	448827.261	116533.703	448827.261	116533.703	Required	
S	448828.439	116558.363			No Entry	

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	150	S1	24.650	23.300	1.200	Open Manhole	1200
S1.001	o	150	S2	24.400	23.050	1.200	Open Manhole	1200
S2.000	o	150	S3	24.680	23.630	0.900	Open Manhole	1200
S2.001	o	150	S4	24.550	23.554	0.846	Open Manhole	1200
S2.002	o	150	S5	24.230	23.352	0.728	Open Manhole	1200
S2.003	o	150	S6	23.950	23.150	0.650	Open Manhole	1200
S1.002	o	225	S3	23.900	22.475	1.200	Open Manhole	1200
S1.003	o	225	S4	23.100	21.675	1.200	Open Manhole	1200
S1.004	o	300	S5	22.750	21.250	1.200	Open Manhole	1200
S1.005	o	300	S6	22.600	20.993	1.307	Open Manhole	1200
S3.000	o	300	S11	22.960	21.460	1.200	Open Manhole	1200
S3.001	o	300	S12	22.600	21.100	1.200	Open Manhole	1200
S3.002	o	375	S13	21.890	20.315	1.200	Open Manhole	1350
S1.006	o	450	S7	21.550	19.700	1.400	Open Manhole	1350
S1.007	o	450	S8	21.300	19.526	1.324	Open Manhole	1350
S4.000	o	225	S16	22.890	21.465	1.200	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	22.797	91.2	S2	24.400	23.050	1.200	Open Manhole	1200
S1.001	19.510	39.0	S3	23.900	22.550	1.200	Open Manhole	1200
S2.000	11.397	150.0	S4	24.550	23.554	0.846	Open Manhole	1200
S2.001	30.322	150.0	S5	24.230	23.352	0.728	Open Manhole	1200
S2.002	26.658	132.0	S6	23.950	23.150	0.650	Open Manhole	1200
S2.003	6.973	11.6	S3	23.900	22.550	1.200	Open Manhole	1200
S1.002	31.372	39.2	S4	23.100	21.675	1.200	Open Manhole	1200
S1.003	18.438	52.7	S5	22.750	21.325	1.200	Open Manhole	1200
S1.004	42.815	167.0	S6	22.600	20.993	1.307	Open Manhole	1200
S1.005	76.810	67.2	S7	21.550	19.850	1.400	Open Manhole	1350
S3.000	24.924	69.2	S12	22.600	21.100	1.200	Open Manhole	1200
S3.001	30.693	43.2	S13	21.890	20.390	1.200	Open Manhole	1350
S3.002	33.968	62.9	S7	21.550	19.775	1.400	Open Manhole	1350
S1.006	43.520	250.1	S8	21.300	19.526	1.324	Open Manhole	1350
S1.007	45.500	139.6	S9	20.950	19.200	1.300	Open Manhole	1500
S4.000	28.917	93.3	S17	22.580	21.155	1.200	Open Manhole	1350

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S4.001	o	375	S17	22.580	21.005	1.200	Open Manhole	1350
S4.002	o	375	S18	22.100	20.525	1.200	Open Manhole	1350
S4.003	o	375	S19	21.850	20.275	1.200	Open Manhole	1350
S4.004	o	375	S20	21.680	20.105	1.200	Open Manhole	1350
S4.005	o	450	S21	21.280	19.630	1.200	Open Manhole	1350
S1.008	o	525	S9	20.950	19.125	1.300	Open Manhole	1500
S1.009	o	525	S10	21.150	19.001	1.624	Open Manhole	1500
S1.010	o	375	S11	20.100	18.900	0.825	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S4.001	44.372	92.4	S18	22.100	20.525	1.200	Open Manhole	1350
S4.002	14.994	60.0	S19	21.850	20.275	1.200	Open Manhole	1350
S4.003	8.401	49.4	S20	21.680	20.105	1.200	Open Manhole	1350
S4.004	33.199	83.0	S21	21.280	19.705	1.200	Open Manhole	1350
S4.005	32.300	75.1	S9	20.950	19.200	1.300	Open Manhole	1500
S1.008	49.622	400.2	S10	21.150	19.001	1.624	Open Manhole	1500
S1.009	58.552	579.7	S11	20.100	18.900	0.675	Open Manhole	1500
S1.010	24.688	35.3	S	18.800	18.200	0.225	Open Manhole	0

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.023	0.023	0.023
1.001	-	-	100	0.020	0.020	0.020
2.000	-	-	100	0.044	0.044	0.044
2.001	-	-	100	0.000	0.000	0.000
2.002	-	-	100	0.000	0.000	0.000
2.003	-	-	100	0.132	0.132	0.132
1.002	-	-	100	0.019	0.019	0.019
1.003	-	-	100	0.039	0.039	0.039
1.004	-	-	100	0.023	0.023	0.023
1.005	-	-	100	0.082	0.082	0.082
3.000	-	-	100	0.113	0.113	0.113
3.001	-	-	100	0.044	0.044	0.044
3.002	-	-	100	0.085	0.085	0.085
1.006	-	-	100	0.137	0.137	0.137
1.007	-	-	100	0.000	0.000	0.000
4.000	-	-	100	0.063	0.063	0.063
4.001	-	-	100	0.158	0.158	0.158
4.002	-	-	100	0.073	0.073	0.073
4.003	-	-	100	0.019	0.019	0.019
4.004	-	-	100	0.083	0.083	0.083
4.005	-	-	100	0.094	0.094	0.094
1.008	-	-	100	0.132	0.132	0.132
1.009	-	-	100	0.143	0.143	0.143
1.010	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				1.526	1.526	1.526

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
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S1.010	S	18.800	18.200	0.000	0	0
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Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1
Number of Input Hydrographs	0	Number of Storage Structures	2
Number of Online Controls	2	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

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Simulation Criteria for Storm <table><tr><td>Rainfall Model</td><td>FSR</td><td>Profile Type</td><td>Summer</td></tr><tr><td>Return Period (years)</td><td>100</td><td>Cv (Summer)</td><td>0.750</td></tr><tr><td>Region</td><td>England and Wales</td><td>Cv (Winter)</td><td>0.840</td></tr><tr><td>M5-60 (mm)</td><td>19.900</td><td>Storm Duration (mins)</td><td>30</td></tr><tr><td>Ratio R</td><td>0.350</td><td></td><td></td></tr></table>			Rainfall Model	FSR	Profile Type	Summer	Return Period (years)	100	Cv (Summer)	0.750	Region	England and Wales	Cv (Winter)	0.840	M5-60 (mm)	19.900	Storm Duration (mins)	30	Ratio R	0.350		
Rainfall Model	FSR	Profile Type	Summer																			
Return Period (years)	100	Cv (Summer)	0.750																			
Region	England and Wales	Cv (Winter)	0.840																			
M5-60 (mm)	19.900	Storm Duration (mins)	30																			
Ratio R	0.350																					
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Online Controls for Storm

Hydro-Brake® Optimum Manhole: S6, DS/PN: S2.003, Volume (m³): 1.4

Unit Reference	MD-SHE-0090-3000-0500-3000
Design Head (m)	0.500
Design Flow (l/s)	3.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	90
Invert Level (m)	23.150
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.500	3.0
Flush-Flo™	0.157	3.0
Kick-Flo®	0.355	2.6
Mean Flow over Head Range	-	2.5

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.8	1.200	4.5	3.000	6.9	7.000	10.4
0.200	3.0	1.400	4.8	3.500	7.4	7.500	10.7
0.300	2.8	1.600	5.1	4.000	7.9	8.000	11.1
0.400	2.7	1.800	5.4	4.500	8.4	8.500	11.4
0.500	3.0	2.000	5.7	5.000	8.8	9.000	11.8
0.600	3.3	2.200	6.0	5.500	9.2	9.500	12.1
0.800	3.7	2.400	6.2	6.000	9.6		
1.000	4.1	2.600	6.4	6.500	10.0		

Hydro-Brake® Optimum Manhole: S11, DS/PN: S1.010, Volume (m³): 14.5

Unit Reference	MD-SHE-0165-1360-1200-1360
Design Head (m)	1.200
Design Flow (l/s)	13.6
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	165
Invert Level (m)	18.900
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

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<u>Hydro-Brake® Optimum Manhole: S11, DS/PN: S1.010, Volume (m³): 14.5</u>																																																																										
<table><tr><td>Control Points</td><td>Head (m)</td><td>Flow (l/s)</td></tr><tr><td>Design Point (Calculated)</td><td>1.200</td><td>13.6</td></tr><tr><td>Flush-Flo™</td><td>0.364</td><td>13.6</td></tr><tr><td>Kick-Flo®</td><td>0.801</td><td>11.2</td></tr><tr><td>Mean Flow over Head Range</td><td>-</td><td>11.7</td></tr></table>			Control Points	Head (m)	Flow (l/s)	Design Point (Calculated)	1.200	13.6	Flush-Flo™	0.364	13.6	Kick-Flo®	0.801	11.2	Mean Flow over Head Range	-	11.7																																																									
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<table><tr><td>Depth (m)</td><td>Flow (l/s)</td><td>Depth (m)</td><td>Flow (l/s)</td><td>Depth (m)</td><td>Flow (l/s)</td><td>Depth (m)</td><td>Flow (l/s)</td></tr><tr><td>0.100</td><td>5.9</td><td>1.200</td><td>13.6</td><td>3.000</td><td>21.0</td><td>7.000</td><td>31.6</td></tr><tr><td>0.200</td><td>12.8</td><td>1.400</td><td>14.6</td><td>3.500</td><td>22.6</td><td>7.500</td><td>32.7</td></tr><tr><td>0.300</td><td>13.5</td><td>1.600</td><td>15.6</td><td>4.000</td><td>24.1</td><td>8.000</td><td>33.7</td></tr><tr><td>0.400</td><td>13.6</td><td>1.800</td><td>16.5</td><td>4.500</td><td>25.5</td><td>8.500</td><td>34.7</td></tr><tr><td>0.500</td><td>13.4</td><td>2.000</td><td>17.3</td><td>5.000</td><td>26.9</td><td>9.000</td><td>35.7</td></tr><tr><td>0.600</td><td>13.1</td><td>2.200</td><td>18.1</td><td>5.500</td><td>28.1</td><td>9.500</td><td>36.6</td></tr><tr><td>0.800</td><td>11.3</td><td>2.400</td><td>18.9</td><td>6.000</td><td>29.3</td><td></td><td></td></tr><tr><td>1.000</td><td>12.5</td><td>2.600</td><td>19.6</td><td>6.500</td><td>30.5</td><td></td><td></td></tr></table>			Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	0.100	5.9	1.200	13.6	3.000	21.0	7.000	31.6	0.200	12.8	1.400	14.6	3.500	22.6	7.500	32.7	0.300	13.5	1.600	15.6	4.000	24.1	8.000	33.7	0.400	13.6	1.800	16.5	4.500	25.5	8.500	34.7	0.500	13.4	2.000	17.3	5.000	26.9	9.000	35.7	0.600	13.1	2.200	18.1	5.500	28.1	9.500	36.6	0.800	11.3	2.400	18.9	6.000	29.3			1.000	12.5	2.600	19.6	6.500	30.5		
Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)																																																																			
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Storage Structures for Storm

Porous Car Park Manhole: S6, DS/PN: S2.003

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	92.3
Membrane Percolation (mm/hr)	1000	Length (m)	12.4
Max Percolation (l/s)	317.9	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	23.150	Membrane Depth (mm)	0

Tank or Pond Manhole: S11, DS/PN: S1.010

Invert Level (m) 18.900

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	807.0	1.200	1502.0

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	19.900	Add Flow / Climate Change (%)	0
Ratio R	0.350	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.035	4-8	0.771	8-12	1.500	12-16	0.026

Total Area Contributing (ha) = 2.332

Total Pipe Volume (m³) = 207.839

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	24.705	0.500	49.4	0.019	4.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	15.427	0.240	64.3	0.017	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.002	27.977	0.680	41.1	0.028	0.00	0.0	0.600	o	150	Pipe/Conduit	
S2.000	6.893	0.600	11.5	0.114	4.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	4.29	25.390	0.019	0.0	0.0	0.0	1.43	25.4	2.6
S1.001	50.00	4.49	24.890	0.036	0.0	0.0	0.0	1.26	22.2	4.9
S1.002	50.00	4.79	24.650	0.064	0.0	0.0	0.0	1.57	27.8	8.7
S2.000	50.00	4.04	25.450	0.114	0.0	0.0	0.0	2.99	52.8	15.4

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.019	40.838	0.095	430.0	0.029	0.00	0.0	0.600	o	675	Pipe/Conduit	
S1.020	31.552	0.061	520.0	0.018	0.00	0.0	0.600	o	675	Pipe/Conduit	
S1.021	24.611	0.047	520.0	0.016	0.00	0.0	0.600	o	675	Pipe/Conduit	
S1.022	21.617	0.042	520.0	0.026	0.00	0.0	0.600	o	675	Pipe/Conduit	
S1.023	95.128	0.107	889.0	0.068	0.00	0.0	0.600	o	675	Pipe/Conduit	
S1.024	108.605	2.400	45.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.019	50.00	8.83	19.552	2.204	0.0	0.0	0.0	1.26	450.0	298.4
S1.020	50.00	9.29	19.457	2.222	0.0	0.0	0.0	1.14	408.8	300.9
S1.021	50.00	9.65	19.396	2.238	0.0	0.0	0.0	1.14	408.8	303.1
S1.022	50.00	9.96	19.349	2.264	0.0	0.0	0.0	1.14	408.8	306.6
S1.023	50.00	11.78	19.307	2.332	0.0	0.0	0.0	0.87	311.6	315.8
S1.024	50.00	12.56	19.200	2.332	0.0	0.0	0.0	2.34	165.7	315.8

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<u>Manhole Schedules for Storm</u>											
MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S1	26.740	1.350	Open Manhole	1200	S1.000	25.390	150				
S2	26.240	1.350	Open Manhole	1200	S1.001	24.890	150	S1.000	24.890	150	
S3	26.000	1.350	Open Manhole	1200	S1.002	24.650	150	S1.001	24.650	150	
S6	26.350	0.900	Open Manhole	1200	S2.000	25.450	150				
S7	26.200	1.350	Open Manhole	1200	S2.001	24.850	150	S2.000	24.850	150	
S8	25.750	1.350	Open Manhole	1200	S3.000	24.400	150				
S4	25.370	1.550	Open Manhole	1200	S1.003	23.820	300	S1.002	23.970	150	
								S2.001	23.970	150	
								S3.000	23.970	150	
S10	25.060	1.425	Open Manhole	1200	S4.000	23.635	225				
S11	24.950	0.800	Open Manhole	1200	S5.000	24.150	150				
S12	24.900	1.350	Open Manhole	1200	S5.001	23.550	150	S5.000	23.550	150	
S11	24.850	1.446	Open Manhole	1200	S4.001	23.404	225	S4.000	23.404	225	
								S5.001	23.479	150	
S14	24.934	1.350	Open Manhole	1200	S6.000	23.584	100				
S11	24.560	1.550	Open Manhole	1200	S4.002	23.010	300	S4.001	23.085	225	
								S6.000	23.210	100	
S5	24.420	1.651	Open Manhole	1350	S1.004	22.769	450	S1.003	22.919	300	
								S4.002	22.919	300	
S6	24.350	1.650	Open Manhole	1350	S1.005	22.700	450	S1.004	22.700	450	
S7	24.180	1.650	Open Manhole	1350	S1.006	22.530	450	S1.005	22.530	450	
S8	24.000	1.725	Open Manhole	1500	S1.007	22.275	525	S1.006	22.350	450	
S9	23.650	1.725	Open Manhole	1500	S1.008	21.925	525	S1.007	21.925	525	
S10	23.500	1.763	Open Manhole	1500	S1.009	21.737	525	S1.008	21.737	525	
S11	23.200	1.838	Open Manhole	1500	S1.010	21.362	600	S1.009	21.437	525	
S12	23.160	1.940	Open Manhole	1500	S1.011	21.220	600	S1.010	21.220	600	
S13	23.460	2.314	Open Manhole	1500	S1.012	21.146	600	S1.011	21.146	600	
S14	23.700	2.619	Open Manhole	1500	S1.013	21.081	600	S1.012	21.081	600	
S15	23.493	2.477	Open Manhole	1500	S1.014	21.017	600	S1.013	21.017	600	
S27	24.900	1.350	Open Manhole	1200	S7.000	23.550	150				
S28	24.840	1.830	Open Manhole	1200	S7.001	23.010	150	S7.000	23.010	150	
S29	25.100	1.350	Open Manhole	1200	S8.000	23.750	150				
S30	24.850	0.800	Open Manhole	1200	S9.000	24.050	150				
S31	24.800	1.350	Open Manhole	1200	S9.001	23.450	150	S9.000	23.450	150	
S30	24.750	1.425	Open Manhole	1200	S8.001	23.325	225	S8.000	23.400	150	
								S9.001	23.400	150	
S29	24.430	1.615	Open Manhole	1200	S7.002	22.815	225	S7.001	22.890	150	
								S8.001	22.815	225	
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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S30	23.401	1.575	Open Manhole	1350	S7.003	21.826	375	S7.002	21.976	225	
S31	23.590	1.903	Open Manhole	1350	S7.004	21.687	375	S7.003	21.687	375	
S32	23.680	2.153	Open Manhole	1350	S7.005	21.527	375	S7.004	21.527	375	
S33	23.400	2.003	Open Manhole	1350	S7.006	21.397	375	S7.005	21.397	375	
S16	23.100	2.179	Open Manhole	1500	S1.015	20.921	600	S1.014	20.921	600	
								S7.006	21.146	375	
S17	22.650	1.900	Open Manhole	1500	S1.016	20.750	600	S1.015	20.750	600	
S18	22.150	1.800	Open Manhole	1500	S1.017	20.350	600	S1.016	20.350	600	
S19	21.790	1.799	Open Manhole	1500	S1.018	19.991	600	S1.017	19.991	600	
S42	22.700	0.800	Open Manhole	1200	S10.000	21.900	150				
S43	22.550	1.350	Open Manhole	1200	S10.001	21.200	150	S10.000	21.200	150	
S44	22.150	1.350	Open Manhole	1200	S10.002	20.800	150	S10.001	20.800	150	
S45	21.900	0.800	Open Manhole	1200	S11.000	21.100	150				
S46	21.850	1.350	Open Manhole	1200	S11.001	20.500	150	S11.000	20.500	150	
S47	21.900	0.800	Open Manhole	1200	S12.000	21.100	150				
S48	21.850	1.350	Open Manhole	1200	S12.001	20.500	150	S12.000	20.500	150	
S47	21.800	1.370	Open Manhole	1200	S11.002	20.430	150	S11.001	20.430	150	
								S12.001	20.430	150	
S48	22.000	1.754	Open Manhole	1200	S11.003	20.246	225	S11.002	20.321	150	
S45	21.910	1.800	Open Manhole	1200	S10.003	20.110	300	S10.002	20.260	150	
								S11.003	20.185	225	
S46	21.710	1.721	Open Manhole	1200	S10.004	19.989	300	S10.003	19.989	300	
S20	21.540	1.988	Open Manhole	1500	S1.019	19.552	675	S1.018	19.627	600	
								S10.004	19.927	300	
S21	21.660	2.203	Open Manhole	1500	S1.020	19.457	675	S1.019	19.457	675	
S22	21.600	2.204	Open Manhole	1500	S1.021	19.396	675	S1.020	19.396	675	
S23	21.350	2.001	Open Manhole	1500	S1.022	19.349	675	S1.021	19.349	675	
S24	21.232	1.925	Open Manhole	1500	S1.023	19.307	675	S1.022	19.307	675	
S25	20.100	0.900	Open Manhole	1500	S1.024	19.200	300	S1.023	19.200	675	
S	17.400	0.600	Open Manhole	0		OUTFALL		S1.024	16.800	300	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1	448931.014	116077.783	448931.014	116077.783	Required	

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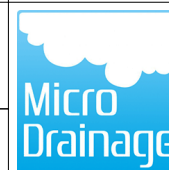
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Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S8	448882.348	116136.931	448882.348	116136.931	Required	
S9	448845.320	116136.832	448845.320	116136.832	Required	
S10	448832.171	116136.603	448832.171	116136.603	Required	
S11	448833.298	116157.091	448833.298	116157.091	Required	
S12	448834.137	116185.508	448834.137	116185.508	Required	
S13	448834.008	116215.225	448834.008	116215.225	Required	
S14	448837.897	116239.508	448837.897	116239.508	Required	
S15	448845.006	116262.330	448845.006	116262.330	Required	
S27	448953.713	116237.146	448953.713	116237.146	Required	
S28	448969.149	116264.724	448969.149	116264.724	Required	
S29	448903.662	116265.943	448903.662	116265.943	Required	
S30	448934.635	116263.654	448934.635	116263.654	Required	
S31	448937.576	116268.156	448937.576	116268.156	Required	
S30	448935.404	116274.655	448935.404	116274.655	Required	
S29	448962.215	116281.367	448962.215	116281.367	Required	

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Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S30	448947.800	116317.447	448947.800	116317.447	Required	
S31	448926.252	116309.033	448926.252	116309.033	Required	
S32	448889.581	116299.030	448889.581	116299.030	Required	
S33	448859.761	116290.455	448859.761	116290.455	Required	
S16	448847.392	116286.957	448847.392	116286.957	Required	
S17	448837.027	116319.559	448837.027	116319.559	Required	
S18	448824.202	116353.103	448824.202	116353.103	Required	
S19	448809.278	116381.775	448809.278	116381.775	Required	
S42	448866.282	116347.134	448866.282	116347.134	Required	
S43	448856.340	116353.529	448856.340	116353.529	Required	
S44	448843.021	116388.410	448843.021	116388.410	Required	
S45	448826.391	116442.773	448826.391	116442.773	Required	
S46	448830.978	116440.499	448830.978	116440.499	Required	
S47	448846.562	116446.635	448846.562	116446.635	Required	
S48	448843.954	116442.162	448843.954	116442.162	Required	

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Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S47	448840.321	116435.868	448840.321	116435.868	Required	
S48	448841.021	116419.464	448841.021	116419.464	Required	
S45	448832.460	116416.233	448832.460	116416.233	Required	
S46	448813.639	116409.129	448813.639	116409.129	Required	
S20	448799.681	116404.380	448799.681	116404.380	Required	
S21	448789.709	116443.983	448789.709	116443.983	Required	
S22	448776.496	116472.634	448776.496	116472.634	Required	
S23	448775.997	116497.240	448775.997	116497.240	Required	
S24	448778.733	116518.684	448778.733	116518.684	Required	
S25	448716.625	116590.739	448716.625	116590.739	Required	
S	448684.937	116694.619			No Entry	

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	150	S1	26.740	25.390	1.200	Open Manhole	1200
S1.001	o	150	S2	26.240	24.890	1.200	Open Manhole	1200
S1.002	o	150	S3	26.000	24.650	1.200	Open Manhole	1200
S2.000	o	150	S6	26.350	25.450	0.750	Open Manhole	1200
S2.001	o	150	S7	26.200	24.850	1.200	Open Manhole	1200
S3.000	o	150	S8	25.750	24.400	1.200	Open Manhole	1200
S1.003	o	300	S4	25.370	23.820	1.250	Open Manhole	1200
S4.000	o	225	S10	25.060	23.635	1.200	Open Manhole	1200
S5.000	o	150	S11	24.950	24.150	0.650	Open Manhole	1200
S5.001	o	150	S12	24.900	23.550	1.200	Open Manhole	1200
S4.001	o	225	S11	24.850	23.404	1.221	Open Manhole	1200
S6.000	o	100	S14	24.934	23.584	1.250	Open Manhole	1200
S4.002	o	300	S11	24.560	23.010	1.250	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	24.705	49.4	S2	26.240	24.890	1.200	Open Manhole	1200
S1.001	15.427	64.3	S3	26.000	24.650	1.200	Open Manhole	1200
S1.002	27.977	41.1	S4	25.370	23.970	1.250	Open Manhole	1200
S2.000	6.893	11.5	S7	26.200	24.850	1.200	Open Manhole	1200
S2.001	19.226	21.8	S4	25.370	23.970	1.250	Open Manhole	1200
S3.000	32.098	74.6	S4	25.370	23.970	1.250	Open Manhole	1200
S1.003	26.440	29.3	S5	24.420	22.919	1.201	Open Manhole	1350
S4.000	21.932	94.9	S11	24.850	23.404	1.221	Open Manhole	1200
S5.000	8.227	13.7	S12	24.900	23.550	1.200	Open Manhole	1200
S5.001	10.622	149.6	S11	24.850	23.479	1.221	Open Manhole	1200
S4.001	27.932	87.6	S11	24.560	23.085	1.250	Open Manhole	1200
S6.000	34.804	93.1	S11	24.560	23.210	1.250	Open Manhole	1200
S4.002	15.195	167.0	S5	24.420	22.919	1.201	Open Manhole	1350

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.004	o	450	S5	24.420	22.769	1.201	Open Manhole	1350
S1.005	o	450	S6	24.350	22.700	1.200	Open Manhole	1350
S1.006	o	450	S7	24.180	22.530	1.200	Open Manhole	1350
S1.007	o	525	S8	24.000	22.275	1.200	Open Manhole	1500
S1.008	o	525	S9	23.650	21.925	1.200	Open Manhole	1500
S1.009	o	525	S10	23.500	21.737	1.238	Open Manhole	1500
S1.010	o	600	S11	23.200	21.362	1.238	Open Manhole	1500
S1.011	o	600	S12	23.160	21.220	1.340	Open Manhole	1500
S1.012	o	600	S13	23.460	21.146	1.714	Open Manhole	1500
S1.013	o	600	S14	23.700	21.081	2.019	Open Manhole	1500
S1.014	o	600	S15	23.493	21.017	1.877	Open Manhole	1500
S7.000	o	150	S27	24.900	23.550	1.200	Open Manhole	1200
S7.001	o	150	S28	24.840	23.010	1.680	Open Manhole	1200
S8.000	o	150	S29	25.100	23.750	1.200	Open Manhole	1200
S9.000	o	150	S30	24.850	24.050	0.650	Open Manhole	1200
S9.001	o	150	S31	24.800	23.450	1.200	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.004	8.061	116.8	S6	24.350	22.700	1.200	Open Manhole	1350
S1.005	17.287	101.7	S7	24.180	22.530	1.200	Open Manhole	1350
S1.006	16.284	90.5	S8	24.000	22.350	1.200	Open Manhole	1500
S1.007	37.029	105.8	S9	23.650	21.925	1.200	Open Manhole	1500
S1.008	13.150	70.0	S10	23.500	21.737	1.238	Open Manhole	1500
S1.009	20.519	68.4	S11	23.200	21.437	1.238	Open Manhole	1500
S1.010	28.429	200.2	S12	23.160	21.220	1.340	Open Manhole	1500
S1.011	29.718	400.0	S13	23.460	21.146	1.714	Open Manhole	1500
S1.012	24.592	380.0	S14	23.700	21.081	2.019	Open Manhole	1500
S1.013	23.904	370.0	S15	23.493	21.017	1.877	Open Manhole	1500
S1.014	24.742	258.8	S16	23.100	20.921	1.579	Open Manhole	1500
S7.000	31.603	58.5	S28	24.840	23.010	1.680	Open Manhole	1200
S7.001	18.030	150.3	S29	24.430	22.890	1.390	Open Manhole	1200
S8.000	32.916	94.0	S30	24.750	23.400	1.200	Open Manhole	1200
S9.000	5.378	9.0	S31	24.800	23.450	1.200	Open Manhole	1200
S9.001	6.852	137.0	S30	24.750	23.400	1.200	Open Manhole	1200

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S8.001	o	225	S30	24.750	23.325	1.200	Open Manhole	1200
S7.002	o	225	S29	24.430	22.815	1.390	Open Manhole	1200
S7.003	o	375	S30	23.401	21.826	1.200	Open Manhole	1350
S7.004	o	375	S31	23.590	21.687	1.528	Open Manhole	1350
S7.005	o	375	S32	23.680	21.527	1.778	Open Manhole	1350
S7.006	o	375	S33	23.400	21.397	1.628	Open Manhole	1350
S1.015	o	600	S16	23.100	20.921	1.579	Open Manhole	1500
S1.016	o	600	S17	22.650	20.750	1.300	Open Manhole	1500
S1.017	o	600	S18	22.150	20.350	1.200	Open Manhole	1500
S1.018	o	600	S19	21.790	19.991	1.199	Open Manhole	1500
S10.000	o	150	S42	22.700	21.900	0.650	Open Manhole	1200
S10.001	o	150	S43	22.550	21.200	1.200	Open Manhole	1200
S10.002	o	150	S44	22.150	20.800	1.200	Open Manhole	1200
S11.000	o	150	S45	21.900	21.100	0.650	Open Manhole	1200
S11.001	o	150	S46	21.850	20.500	1.200	Open Manhole	1200
S12.000	o	150	S47	21.900	21.100	0.650	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S8.001	27.638	54.2	S29	24.430	22.815	1.390	Open Manhole	1200
S7.002	38.852	46.3	S30	23.401	21.976	1.200	Open Manhole	1350
S7.003	23.133	166.4	S31	23.590	21.687	1.528	Open Manhole	1350
S7.004	38.011	238.0	S32	23.680	21.527	1.778	Open Manhole	1350
S7.005	31.029	238.0	S33	23.400	21.397	1.628	Open Manhole	1350
S7.006	12.853	51.2	S16	23.100	21.146	1.579	Open Manhole	1500
S1.015	34.210	200.0	S17	22.650	20.750	1.300	Open Manhole	1500
S1.016	35.912	89.8	S18	22.150	20.350	1.200	Open Manhole	1500
S1.017	32.324	90.0	S19	21.790	19.991	1.199	Open Manhole	1500
S1.018	24.558	67.5	S20	21.540	19.627	1.313	Open Manhole	1500
S10.000	11.822	16.9	S43	22.550	21.200	1.200	Open Manhole	1200
S10.001	37.337	93.3	S44	22.150	20.800	1.200	Open Manhole	1200
S10.002	29.760	55.1	S45	21.910	20.260	1.500	Open Manhole	1200
S11.000	5.120	8.5	S46	21.850	20.500	1.200	Open Manhole	1200
S11.001	10.428	149.0	S47	21.800	20.430	1.220	Open Manhole	1200
S12.000	5.178	8.6	S48	21.850	20.500	1.200	Open Manhole	1200

Odyssey Markides LLP		Page 15
Tuscany House White Hart Lane Basingstoke RG21 4AF	ONE HORTON HEATH BASIN L	
Date 15/12/2020 12:27 File 2020-11-03 Basin South ...	Designed by NA Checked by GG	
Innovyze	Network 2020.1	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S12.001	o	150	S48	21.850	20.500	1.200	Open Manhole	1200
S11.002	o	150	S47	21.800	20.430	1.220	Open Manhole	1200
S11.003	o	225	S48	22.000	20.246	1.529	Open Manhole	1200
S10.003	o	300	S45	21.910	20.110	1.500	Open Manhole	1200
S10.004	o	300	S46	21.710	19.989	1.421	Open Manhole	1200
S1.019	o	675	S20	21.540	19.552	1.313	Open Manhole	1500
S1.020	o	675	S21	21.660	19.457	1.528	Open Manhole	1500
S1.021	o	675	S22	21.600	19.396	1.529	Open Manhole	1500
S1.022	o	675	S23	21.350	19.349	1.326	Open Manhole	1500
S1.023	o	675	S24	21.232	19.307	1.250	Open Manhole	1500
S1.024	o	300	S25	20.100	19.200	0.600	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S12.001	7.268	103.8	S47	21.800	20.430	1.220	Open Manhole	1200
S11.002	16.418	150.0	S48	22.000	20.321	1.529	Open Manhole	1200
S11.003	9.150	150.0	S45	21.910	20.185	1.500	Open Manhole	1200
S10.003	20.118	167.0	S46	21.710	19.989	1.421	Open Manhole	1200
S10.004	14.743	238.0	S20	21.540	19.927	1.313	Open Manhole	1500
S1.019	40.838	430.0	S21	21.660	19.457	1.528	Open Manhole	1500
S1.020	31.552	520.0	S22	21.600	19.396	1.529	Open Manhole	1500
S1.021	24.611	520.0	S23	21.350	19.349	1.326	Open Manhole	1500
S1.022	21.617	520.0	S24	21.232	19.307	1.249	Open Manhole	1500
S1.023	95.128	889.0	S25	20.100	19.200	0.225	Open Manhole	1500
S1.024	108.605	45.3	S	17.400	16.800	0.300	Open Manhole	0

Odyssey Markides LLP		Page 16																																																																																																																																																																																																																																																																																																																																																																												
Tuscany House White Hart Lane Basingstoke RG21 4AF	ONE HORTON HEATH BASIN L																																																																																																																																																																																																																																																																																																																																																																													
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Area Summary for Storm <table><thead><tr><th>Pipe Number</th><th>PIMP Type</th><th>PIMP Name</th><th>PIMP (%)</th><th>Gross Area (ha)</th><th>Imp. Area (ha)</th><th>Pipe Total (ha)</th></tr></thead><tbody><tr><td>1.000</td><td>-</td><td>-</td><td>100</td><td>0.019</td><td>0.019</td><td>0.019</td></tr><tr><td>1.001</td><td>-</td><td>-</td><td>100</td><td>0.017</td><td>0.017</td><td>0.017</td></tr><tr><td>1.002</td><td>-</td><td>-</td><td>100</td><td>0.028</td><td>0.028</td><td>0.028</td></tr><tr><td>2.000</td><td>-</td><td>-</td><td>100</td><td>0.114</td><td>0.114</td><td>0.114</td></tr><tr><td>2.001</td><td>-</td><td>-</td><td>100</td><td>0.000</td><td>0.000</td><td>0.000</td></tr><tr><td>3.000</td><td>-</td><td>-</td><td>100</td><td>0.032</td><td>0.032</td><td>0.032</td></tr><tr><td>1.003</td><td>-</td><td>-</td><td>100</td><td>0.133</td><td>0.133</td><td>0.133</td></tr><tr><td>4.000</td><td>-</td><td>-</td><td>100</td><td>0.085</td><td>0.085</td><td>0.085</td></tr><tr><td>5.000</td><td>-</td><td>-</td><td>100</td><td>0.084</td><td>0.084</td><td>0.084</td></tr><tr><td>5.001</td><td>-</td><td>-</td><td>100</td><td>0.000</td><td>0.000</td><td>0.000</td></tr><tr><td>4.001</td><td>-</td><td>-</td><td>100</td><td>0.000</td><td>0.000</td><td>0.000</td></tr><tr><td>6.000</td><td>-</td><td>-</td><td>100</td><td>0.012</td><td>0.012</td><td>0.012</td></tr><tr><td>4.002</td><td>-</td><td>-</td><td>100</td><td>0.075</td><td>0.075</td><td>0.075</td></tr><tr><td>1.004</td><td>-</td><td>-</td><td>100</td><td>0.000</td><td>0.000</td><td>0.000</td></tr><tr><td>1.005</td><td>-</td><td>-</td><td>100</td><td>0.037</td><td>0.037</td><td>0.037</td></tr><tr><td>1.006</td><td>-</td><td>-</td><td>100</td><td>0.000</td><td>0.000</td><td>0.000</td></tr><tr><td>1.007</td><td>-</td><td>-</td><td>100</td><td>0.358</td><td>0.358</td><td>0.358</td></tr><tr><td>1.008</td><td>-</td><td>-</td><td>100</td><td>0.040</td><td>0.040</td><td>0.040</td></tr><tr><td>1.009</td><td>-</td><td>-</td><td>100</td><td>0.107</td><td>0.107</td><td>0.107</td></tr><tr><td>1.010</td><td>-</td><td>-</td><td>100</td><td>0.027</td><td>0.027</td><td>0.027</td></tr><tr><td>1.011</td><td>-</td><td>-</td><td>100</td><td>0.018</td><td>0.018</td><td>0.018</td></tr><tr><td>1.012</td><td>-</td><td>-</td><td>100</td><td>0.024</td><td>0.024</td><td>0.024</td></tr><tr><td>1.013</td><td>-</td><td>-</td><td>100</td><td>0.024</td><td>0.024</td><td>0.024</td></tr><tr><td>1.014</td><td>-</td><td>-</td><td>100</td><td>0.024</td><td>0.024</td><td>0.024</td></tr><tr><td>7.000</td><td>-</td><td>-</td><td>100</td><td>0.027</td><td>0.027</td><td>0.027</td></tr><tr><td>7.001</td><td>-</td><td>-</td><td>100</td><td>0.044</td><td>0.044</td><td>0.044</td></tr><tr><td>8.000</td><td>-</td><td>-</td><td>100</td><td>0.032</td><td>0.032</td><td>0.032</td></tr><tr><td>9.000</td><td>-</td><td>-</td><td>100</td><td>0.041</td><td>0.041</td><td>0.041</td></tr><tr><td>9.001</td><td>-</td><td>-</td><td>100</td><td>0.000</td><td>0.000</td><td>0.000</td></tr><tr><td>8.001</td><td>-</td><td>-</td><td>100</td><td>0.066</td><td>0.066</td><td>0.066</td></tr><tr><td>7.002</td><td>-</td><td>-</td><td>100</td><td>0.031</td><td>0.031</td><td>0.031</td></tr><tr><td>7.003</td><td>-</td><td>-</td><td>100</td><td>0.000</td><td>0.000</td><td>0.000</td></tr><tr><td>7.004</td><td>-</td><td>-</td><td>100</td><td>0.101</td><td>0.101</td><td>0.101</td></tr><tr><td>7.005</td><td>-</td><td>-</td><td>100</td><td>0.076</td><td>0.076</td><td>0.076</td></tr><tr><td>7.006</td><td>-</td><td>-</td><td>100</td><td>0.080</td><td>0.080</td><td>0.080</td></tr><tr><td>1.015</td><td>-</td><td>-</td><td>100</td><td>0.000</td><td>0.000</td><td>0.000</td></tr><tr><td>1.016</td><td>-</td><td>-</td><td>100</td><td>0.000</td><td>0.000</td><td>0.000</td></tr><tr><td>1.017</td><td>-</td><td>-</td><td>100</td><td>0.030</td><td>0.030</td><td>0.030</td></tr><tr><td>1.018</td><td>-</td><td>-</td><td>100</td><td>0.020</td><td>0.020</td><td>0.020</td></tr><tr><td>10.000</td><td>-</td><td>-</td><td>100</td><td>0.111</td><td>0.111</td><td>0.111</td></tr><tr><td>10.001</td><td>-</td><td>-</td><td>100</td><td>0.000</td><td>0.000</td><td>0.000</td></tr><tr><td>10.002</td><td>-</td><td>-</td><td>100</td><td>0.064</td><td>0.064</td><td>0.064</td></tr><tr><td>11.000</td><td>-</td><td>-</td><td>100</td><td>0.059</td><td>0.059</td><td>0.059</td></tr><tr><td>11.001</td><td>-</td><td>-</td><td>100</td><td>0.000</td><td>0.000</td><td>0.000</td></tr><tr><td>12.000</td><td>-</td><td>-</td><td>100</td><td>0.044</td><td>0.044</td><td>0.044</td></tr><tr><td>12.001</td><td>-</td><td>-</td><td>100</td><td>0.000</td><td>0.000</td><td>0.000</td></tr><tr><td>11.002</td><td>-</td><td>-</td><td>100</td><td>0.000</td><td>0.000</td><td>0.000</td></tr><tr><td>11.003</td><td>-</td><td>-</td><td>100</td><td>0.026</td><td>0.026</td><td>0.026</td></tr><tr><td>10.003</td><td>-</td><td>-</td><td>100</td><td>0.033</td><td>0.033</td><td>0.033</td></tr><tr><td>10.004</td><td>-</td><td>-</td><td>100</td><td>0.032</td><td>0.032</td><td>0.032</td></tr><tr><td>1.019</td><td>-</td><td>-</td><td>100</td><td>0.029</td><td>0.029</td><td>0.029</td></tr></tbody></table>			Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)	1.000	-	-	100	0.019	0.019	0.019	1.001	-	-	100	0.017	0.017	0.017	1.002	-	-	100	0.028	0.028	0.028	2.000	-	-	100	0.114	0.114	0.114	2.001	-	-	100	0.000	0.000	0.000	3.000	-	-	100	0.032	0.032	0.032	1.003	-	-	100	0.133	0.133	0.133	4.000	-	-	100	0.085	0.085	0.085	5.000	-	-	100	0.084	0.084	0.084	5.001	-	-	100	0.000	0.000	0.000	4.001	-	-	100	0.000	0.000	0.000	6.000	-	-	100	0.012	0.012	0.012	4.002	-	-	100	0.075	0.075	0.075	1.004	-	-	100	0.000	0.000	0.000	1.005	-	-	100	0.037	0.037	0.037	1.006	-	-	100	0.000	0.000	0.000	1.007	-	-	100	0.358	0.358	0.358	1.008	-	-	100	0.040	0.040	0.040	1.009	-	-	100	0.107	0.107	0.107	1.010	-	-	100	0.027	0.027	0.027	1.011	-	-	100	0.018	0.018	0.018	1.012	-	-	100	0.024	0.024	0.024	1.013	-	-	100	0.024	0.024	0.024	1.014	-	-	100	0.024	0.024	0.024	7.000	-	-	100	0.027	0.027	0.027	7.001	-	-	100	0.044	0.044	0.044	8.000	-	-	100	0.032	0.032	0.032	9.000	-	-	100	0.041	0.041	0.041	9.001	-	-	100	0.000	0.000	0.000	8.001	-	-	100	0.066	0.066	0.066	7.002	-	-	100	0.031	0.031	0.031	7.003	-	-	100	0.000	0.000	0.000	7.004	-	-	100	0.101	0.101	0.101	7.005	-	-	100	0.076	0.076	0.076	7.006	-	-	100	0.080	0.080	0.080	1.015	-	-	100	0.000	0.000	0.000	1.016	-	-	100	0.000	0.000	0.000	1.017	-	-	100	0.030	0.030	0.030	1.018	-	-	100	0.020	0.020	0.020	10.000	-	-	100	0.111	0.111	0.111	10.001	-	-	100	0.000	0.000	0.000	10.002	-	-	100	0.064	0.064	0.064	11.000	-	-	100	0.059	0.059	0.059	11.001	-	-	100	0.000	0.000	0.000	12.000	-	-	100	0.044	0.044	0.044	12.001	-	-	100	0.000	0.000	0.000	11.002	-	-	100	0.000	0.000	0.000	11.003	-	-	100	0.026	0.026	0.026	10.003	-	-	100	0.033	0.033	0.033	10.004	-	-	100	0.032	0.032	0.032	1.019	-	-	100	0.029	0.029	0.029
Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)																																																																																																																																																																																																																																																																																																																																																																								
1.000	-	-	100	0.019	0.019	0.019																																																																																																																																																																																																																																																																																																																																																																								
1.001	-	-	100	0.017	0.017	0.017																																																																																																																																																																																																																																																																																																																																																																								
1.002	-	-	100	0.028	0.028	0.028																																																																																																																																																																																																																																																																																																																																																																								
2.000	-	-	100	0.114	0.114	0.114																																																																																																																																																																																																																																																																																																																																																																								
2.001	-	-	100	0.000	0.000	0.000																																																																																																																																																																																																																																																																																																																																																																								
3.000	-	-	100	0.032	0.032	0.032																																																																																																																																																																																																																																																																																																																																																																								
1.003	-	-	100	0.133	0.133	0.133																																																																																																																																																																																																																																																																																																																																																																								
4.000	-	-	100	0.085	0.085	0.085																																																																																																																																																																																																																																																																																																																																																																								
5.000	-	-	100	0.084	0.084	0.084																																																																																																																																																																																																																																																																																																																																																																								
5.001	-	-	100	0.000	0.000	0.000																																																																																																																																																																																																																																																																																																																																																																								
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6.000	-	-	100	0.012	0.012	0.012																																																																																																																																																																																																																																																																																																																																																																								
4.002	-	-	100	0.075	0.075	0.075																																																																																																																																																																																																																																																																																																																																																																								
1.004	-	-	100	0.000	0.000	0.000																																																																																																																																																																																																																																																																																																																																																																								
1.005	-	-	100	0.037	0.037	0.037																																																																																																																																																																																																																																																																																																																																																																								
1.006	-	-	100	0.000	0.000	0.000																																																																																																																																																																																																																																																																																																																																																																								
1.007	-	-	100	0.358	0.358	0.358																																																																																																																																																																																																																																																																																																																																																																								
1.008	-	-	100	0.040	0.040	0.040																																																																																																																																																																																																																																																																																																																																																																								
1.009	-	-	100	0.107	0.107	0.107																																																																																																																																																																																																																																																																																																																																																																								
1.010	-	-	100	0.027	0.027	0.027																																																																																																																																																																																																																																																																																																																																																																								
1.011	-	-	100	0.018	0.018	0.018																																																																																																																																																																																																																																																																																																																																																																								
1.012	-	-	100	0.024	0.024	0.024																																																																																																																																																																																																																																																																																																																																																																								
1.013	-	-	100	0.024	0.024	0.024																																																																																																																																																																																																																																																																																																																																																																								
1.014	-	-	100	0.024	0.024	0.024																																																																																																																																																																																																																																																																																																																																																																								
7.000	-	-	100	0.027	0.027	0.027																																																																																																																																																																																																																																																																																																																																																																								
7.001	-	-	100	0.044	0.044	0.044																																																																																																																																																																																																																																																																																																																																																																								
8.000	-	-	100	0.032	0.032	0.032																																																																																																																																																																																																																																																																																																																																																																								
9.000	-	-	100	0.041	0.041	0.041																																																																																																																																																																																																																																																																																																																																																																								
9.001	-	-	100	0.000	0.000	0.000																																																																																																																																																																																																																																																																																																																																																																								
8.001	-	-	100	0.066	0.066	0.066																																																																																																																																																																																																																																																																																																																																																																								
7.002	-	-	100	0.031	0.031	0.031																																																																																																																																																																																																																																																																																																																																																																								
7.003	-	-	100	0.000	0.000	0.000																																																																																																																																																																																																																																																																																																																																																																								
7.004	-	-	100	0.101	0.101	0.101																																																																																																																																																																																																																																																																																																																																																																								
7.005	-	-	100	0.076	0.076	0.076																																																																																																																																																																																																																																																																																																																																																																								
7.006	-	-	100	0.080	0.080	0.080																																																																																																																																																																																																																																																																																																																																																																								
1.015	-	-	100	0.000	0.000	0.000																																																																																																																																																																																																																																																																																																																																																																								
1.016	-	-	100	0.000	0.000	0.000																																																																																																																																																																																																																																																																																																																																																																								
1.017	-	-	100	0.030	0.030	0.030																																																																																																																																																																																																																																																																																																																																																																								
1.018	-	-	100	0.020	0.020	0.020																																																																																																																																																																																																																																																																																																																																																																								
10.000	-	-	100	0.111	0.111	0.111																																																																																																																																																																																																																																																																																																																																																																								
10.001	-	-	100	0.000	0.000	0.000																																																																																																																																																																																																																																																																																																																																																																								
10.002	-	-	100	0.064	0.064	0.064																																																																																																																																																																																																																																																																																																																																																																								
11.000	-	-	100	0.059	0.059	0.059																																																																																																																																																																																																																																																																																																																																																																								
11.001	-	-	100	0.000	0.000	0.000																																																																																																																																																																																																																																																																																																																																																																								
12.000	-	-	100	0.044	0.044	0.044																																																																																																																																																																																																																																																																																																																																																																								
12.001	-	-	100	0.000	0.000	0.000																																																																																																																																																																																																																																																																																																																																																																								
11.002	-	-	100	0.000	0.000	0.000																																																																																																																																																																																																																																																																																																																																																																								
11.003	-	-	100	0.026	0.026	0.026																																																																																																																																																																																																																																																																																																																																																																								
10.003	-	-	100	0.033	0.033	0.033																																																																																																																																																																																																																																																																																																																																																																								
10.004	-	-	100	0.032	0.032	0.032																																																																																																																																																																																																																																																																																																																																																																								
1.019	-	-	100	0.029	0.029	0.029																																																																																																																																																																																																																																																																																																																																																																								
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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.020	-	-	100	0.018	0.018	0.018
1.021	-	-	100	0.016	0.016	0.016
1.022	-	-	100	0.026	0.026	0.026
1.023	-	-	100	0.068	0.068	0.068
1.024	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				2.332	2.332	2.332

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
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S1.024	S	17.400	16.800	0.000	0	0
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Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	7
Number of Online Controls	7	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.900	Storm Duration (mins)	30
Ratio R	0.350		

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: S7, DS/PN: S2.001, Volume (m³): 1.6

Unit Reference MD-SHE-0146-1050-1200-1050
Design Head (m) 1.200
Design Flow (l/s) 10.5
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 146
Invert Level (m) 24.850
Minimum Outlet Pipe Diameter (mm) 225
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	10.5
Flush-Flo™	0.359	10.5
Kick-Flo®	0.783	8.6
Mean Flow over Head Range	-	9.1

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.3	1.200	10.5	3.000	16.2	7.000	24.3
0.200	9.9	1.400	11.3	3.500	17.4	7.500	25.1
0.300	10.4	1.600	12.0	4.000	18.6	8.000	25.9
0.400	10.5	1.800	12.7	4.500	19.7	8.500	26.7
0.500	10.3	2.000	13.4	5.000	20.7	9.000	27.4
0.600	10.0	2.200	14.0	5.500	21.7	9.500	28.2
0.800	8.7	2.400	14.6	6.000	22.6		
1.000	9.6	2.600	15.1	6.500	23.5		

Hydro-Brake® Optimum Manhole: S12, DS/PN: S5.001, Volume (m³): 1.7

Unit Reference MD-SHE-0099-4500-1100-4500
Design Head (m) 1.100
Design Flow (l/s) 4.5
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 99
Invert Level (m) 23.550
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1200

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Hydro-Brake® Optimum Manhole: S12, DS/PN: S5.001, Volume (m³): 1.7

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.100	4.5
Flush-Flo™	0.329	4.5
Kick-Flo®	0.693	3.6
Mean Flow over Head Range	-	3.9

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.2	1.200	4.7	3.000	7.2	7.000	10.7
0.200	4.3	1.400	5.0	3.500	7.7	7.500	11.1
0.300	4.5	1.600	5.4	4.000	8.2	8.000	11.4
0.400	4.5	1.800	5.7	4.500	8.7	8.500	11.8
0.500	4.4	2.000	5.9	5.000	9.1	9.000	12.1
0.600	4.1	2.200	6.2	5.500	9.6	9.500	12.4
0.800	3.9	2.400	6.5	6.000	10.0		
1.000	4.3	2.600	6.7	6.500	10.4		

Hydro-Brake® Optimum Manhole: S31, DS/PN: S9.001, Volume (m³): 1.6

Unit Reference	MD-SHE-0093-4000-1100-4000
Design Head (m)	1.100
Design Flow (l/s)	4.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	93
Invert Level (m)	23.450
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.100	4.0
Flush-Flo™	0.326	4.0
Kick-Flo®	0.684	3.2
Mean Flow over Head Range	-	3.5

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.0	0.300	4.0	0.500	3.9	0.800	3.5
0.200	3.8	0.400	4.0	0.600	3.6	1.000	3.8

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Hydro-Brake® Optimum Manhole: S31, DS/PN: S9.001, Volume (m³): 1.6 <table><tr><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th></tr><tr><td>1.200</td><td>4.2</td><td>2.400</td><td>5.7</td><td>5.000</td><td>8.1</td><td>8.000</td><td>10.2</td></tr><tr><td>1.400</td><td>4.5</td><td>2.600</td><td>6.0</td><td>5.500</td><td>8.5</td><td>8.500</td><td>10.5</td></tr><tr><td>1.600</td><td>4.8</td><td>3.000</td><td>6.4</td><td>6.000</td><td>8.9</td><td>9.000</td><td>10.7</td></tr><tr><td>1.800</td><td>5.0</td><td>3.500</td><td>6.9</td><td>6.500</td><td>9.2</td><td>9.500</td><td>11.0</td></tr><tr><td>2.000</td><td>5.3</td><td>4.000</td><td>7.3</td><td>7.000</td><td>9.5</td><td></td><td></td></tr><tr><td>2.200</td><td>5.5</td><td>4.500</td><td>7.7</td><td>7.500</td><td>9.8</td><td></td><td></td></tr></table> Hydro-Brake® Optimum Manhole: S43, DS/PN: S10.001, Volume (m³): 1.7 <table><tr><td>Unit Reference</td><td>MD-SHE-0079-3000-1200-3000</td></tr><tr><td>Design Head (m)</td><td>1.200</td></tr><tr><td>Design Flow (l/s)</td><td>3.0</td></tr><tr><td>Flush-Flo™</td><td>Calculated</td></tr><tr><td>Objective</td><td>Minimise upstream storage</td></tr><tr><td>Application</td><td>Surface</td></tr><tr><td>Sump Available</td><td>Yes</td></tr><tr><td>Diameter (mm)</td><td>79</td></tr><tr><td>Invert Level (m)</td><td>21.200</td></tr><tr><td>Minimum Outlet Pipe Diameter (mm)</td><td>100</td></tr><tr><td>Suggested Manhole Diameter (mm)</td><td>1200</td></tr></table> <table><tr><th>Control Points</th><th>Head (m)</th><th>Flow (l/s)</th></tr><tr><td>Design Point (Calculated)</td><td>1.200</td><td>3.0</td></tr><tr><td>Flush-Flo™</td><td>0.348</td><td>2.9</td></tr><tr><td>Kick-Flo®</td><td>0.707</td><td>2.4</td></tr><tr><td>Mean Flow over Head Range</td><td>-</td><td>2.6</td></tr></table> The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated <table><tr><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th></tr><tr><td>0.100</td><td>2.3</td><td>1.200</td><td>3.0</td><td>3.000</td><td>4.6</td><td>7.000</td><td>6.8</td></tr><tr><td>0.200</td><td>2.8</td><td>1.400</td><td>3.2</td><td>3.500</td><td>4.9</td><td>7.500</td><td>7.0</td></tr><tr><td>0.300</td><td>2.9</td><td>1.600</td><td>3.4</td><td>4.000</td><td>5.2</td><td>8.000</td><td>7.3</td></tr><tr><td>0.400</td><td>2.9</td><td>1.800</td><td>3.6</td><td>4.500</td><td>5.5</td><td>8.500</td><td>7.5</td></tr><tr><td>0.500</td><td>2.8</td><td>2.000</td><td>3.8</td><td>5.000</td><td>5.8</td><td>9.000</td><td>7.7</td></tr><tr><td>0.600</td><td>2.7</td><td>2.200</td><td>4.0</td><td>5.500</td><td>6.1</td><td>9.500</td><td>7.9</td></tr><tr><td>0.800</td><td>2.5</td><td>2.400</td><td>4.1</td><td>6.000</td><td>6.3</td><td></td><td></td></tr><tr><td>1.000</td><td>2.8</td><td>2.600</td><td>4.3</td><td>6.500</td><td>6.6</td><td></td><td></td></tr></table> Hydro-Brake® Optimum Manhole: S46, DS/PN: S11.001, Volume (m³): 1.6 <table><tr><td>Unit Reference</td><td>MD-SHE-0081-3000-1100-3000</td></tr><tr><td>Design Head (m)</td><td>1.100</td></tr><tr><td>Design Flow (l/s)</td><td>3.0</td></tr><tr><td>Flush-Flo™</td><td>Calculated</td></tr></table>				Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	1.200	4.2	2.400	5.7	5.000	8.1	8.000	10.2	1.400	4.5	2.600	6.0	5.500	8.5	8.500	10.5	1.600	4.8	3.000	6.4	6.000	8.9	9.000	10.7	1.800	5.0	3.500	6.9	6.500	9.2	9.500	11.0	2.000	5.3	4.000	7.3	7.000	9.5			2.200	5.5	4.500	7.7	7.500	9.8			Unit Reference	MD-SHE-0079-3000-1200-3000	Design Head (m)	1.200	Design Flow (l/s)	3.0	Flush-Flo™	Calculated	Objective	Minimise upstream storage	Application	Surface	Sump Available	Yes	Diameter (mm)	79	Invert Level (m)	21.200	Minimum Outlet Pipe Diameter (mm)	100	Suggested Manhole Diameter (mm)	1200	Control Points	Head (m)	Flow (l/s)	Design Point (Calculated)	1.200	3.0	Flush-Flo™	0.348	2.9	Kick-Flo®	0.707	2.4	Mean Flow over Head Range	-	2.6	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	0.100	2.3	1.200	3.0	3.000	4.6	7.000	6.8	0.200	2.8	1.400	3.2	3.500	4.9	7.500	7.0	0.300	2.9	1.600	3.4	4.000	5.2	8.000	7.3	0.400	2.9	1.800	3.6	4.500	5.5	8.500	7.5	0.500	2.8	2.000	3.8	5.000	5.8	9.000	7.7	0.600	2.7	2.200	4.0	5.500	6.1	9.500	7.9	0.800	2.5	2.400	4.1	6.000	6.3			1.000	2.8	2.600	4.3	6.500	6.6			Unit Reference	MD-SHE-0081-3000-1100-3000	Design Head (m)	1.100	Design Flow (l/s)	3.0	Flush-Flo™	Calculated
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<u>Hydro-Brake® Optimum Manhole: S46, DS/PN: S11.001, Volume (m³): 1.6</u> Objective Minimise upstream storage Application Surface Sump Available Yes Diameter (mm) 81 Invert Level (m) 20.500 Minimum Outlet Pipe Diameter (mm) 100 Suggested Manhole Diameter (mm) 1200 <table><tr><th>Control Points</th><th>Head (m)</th><th>Flow (l/s)</th></tr><tr><td>Design Point (Calculated)</td><td>1.100</td><td>3.0</td></tr><tr><td>Flush-Flo™</td><td>0.333</td><td>3.0</td></tr><tr><td>Kick-Flo®</td><td>0.682</td><td>2.4</td></tr><tr><td>Mean Flow over Head Range</td><td>-</td><td>2.6</td></tr></table> The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated <table><tr><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th></tr><tr><td>0.100</td><td>2.4</td><td>1.200</td><td>3.1</td><td>3.000</td><td>4.8</td><td>7.000</td><td>7.1</td></tr><tr><td>0.200</td><td>2.9</td><td>1.400</td><td>3.4</td><td>3.500</td><td>5.1</td><td>7.500</td><td>7.3</td></tr><tr><td>0.300</td><td>3.0</td><td>1.600</td><td>3.6</td><td>4.000</td><td>5.5</td><td>8.000</td><td>7.6</td></tr><tr><td>0.400</td><td>3.0</td><td>1.800</td><td>3.8</td><td>4.500</td><td>5.8</td><td>8.500</td><td>7.8</td></tr><tr><td>0.500</td><td>2.9</td><td>2.000</td><td>4.0</td><td>5.000</td><td>6.1</td><td>9.000</td><td>8.0</td></tr><tr><td>0.600</td><td>2.7</td><td>2.200</td><td>4.1</td><td>5.500</td><td>6.3</td><td>9.500</td><td>8.2</td></tr><tr><td>0.800</td><td>2.6</td><td>2.400</td><td>4.3</td><td>6.000</td><td>6.6</td><td></td><td></td></tr><tr><td>1.000</td><td>2.9</td><td>2.600</td><td>4.5</td><td>6.500</td><td>6.9</td><td></td><td></td></tr></table> <u>Hydro-Brake® Optimum Manhole: S48, DS/PN: S12.001, Volume (m³): 1.6</u> Unit Reference MD-SHE-0081-3000-1100-3000 Design Head (m) 1.100 Design Flow (l/s) 3.0 Flush-Flo™ Calculated Objective Minimise upstream storage Application Surface Sump Available Yes Diameter (mm) 81 Invert Level (m) 20.500 Minimum Outlet Pipe Diameter (mm) 100 Suggested Manhole Diameter (mm) 1200 <table><tr><th>Control Points</th><th>Head (m)</th><th>Flow (l/s)</th></tr><tr><td>Design Point (Calculated)</td><td>1.100</td><td>3.0</td></tr><tr><td>Flush-Flo™</td><td>0.333</td><td>3.0</td></tr><tr><td>Kick-Flo®</td><td>0.682</td><td>2.4</td></tr><tr><td>Mean Flow over Head Range</td><td>-</td><td>2.6</td></tr></table> The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a			Control Points	Head (m)	Flow (l/s)	Design Point (Calculated)	1.100	3.0	Flush-Flo™	0.333	3.0	Kick-Flo®	0.682	2.4	Mean Flow over Head Range	-	2.6	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	0.100	2.4	1.200	3.1	3.000	4.8	7.000	7.1	0.200	2.9	1.400	3.4	3.500	5.1	7.500	7.3	0.300	3.0	1.600	3.6	4.000	5.5	8.000	7.6	0.400	3.0	1.800	3.8	4.500	5.8	8.500	7.8	0.500	2.9	2.000	4.0	5.000	6.1	9.000	8.0	0.600	2.7	2.200	4.1	5.500	6.3	9.500	8.2	0.800	2.6	2.400	4.3	6.000	6.6			1.000	2.9	2.600	4.5	6.500	6.9			Control Points	Head (m)	Flow (l/s)	Design Point (Calculated)	1.100	3.0	Flush-Flo™	0.333	3.0	Kick-Flo®	0.682	2.4	Mean Flow over Head Range	-	2.6
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Storage Structures for Storm Porous Car Park Manhole: S6, DS/PN: S2.000 <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Width (m)</td><td>10.3</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>1000</td><td>Length (m)</td><td>37.1</td></tr><tr><td>Max Percolation (l/s)</td><td>106.1</td><td>Slope (1:X)</td><td>40.0</td></tr><tr><td>Safety Factor</td><td>2.0</td><td>Depression Storage (mm)</td><td>5</td></tr><tr><td>Porosity</td><td>0.30</td><td>Evaporation (mm/day)</td><td>3</td></tr><tr><td>Invert Level (m)</td><td>25.450</td><td>Membrane Depth (mm)</td><td>0</td></tr></table> Porous Car Park Manhole: S11, DS/PN: S5.000 <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Width (m)</td><td>12.0</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>1000</td><td>Length (m)</td><td>59.8</td></tr><tr><td>Max Percolation (l/s)</td><td>199.3</td><td>Slope (1:X)</td><td>50.0</td></tr><tr><td>Safety Factor</td><td>2.0</td><td>Depression Storage (mm)</td><td>5</td></tr><tr><td>Porosity</td><td>0.30</td><td>Evaporation (mm/day)</td><td>3</td></tr><tr><td>Invert Level (m)</td><td>24.150</td><td>Membrane Depth (mm)</td><td>0</td></tr></table> Porous Car Park Manhole: S30, DS/PN: S9.000 <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Width (m)</td><td>12.0</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>1000</td><td>Length (m)</td><td>59.9</td></tr><tr><td>Max Percolation (l/s)</td><td>199.7</td><td>Slope (1:X)</td><td>50.0</td></tr><tr><td>Safety Factor</td><td>2.0</td><td>Depression Storage (mm)</td><td>5</td></tr><tr><td>Porosity</td><td>0.30</td><td>Evaporation (mm/day)</td><td>3</td></tr><tr><td>Invert Level (m)</td><td>24.050</td><td>Membrane Depth (mm)</td><td>0</td></tr></table> Porous Car Park Manhole: S42, DS/PN: S10.000 <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Width (m)</td><td>15.8</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>1000</td><td>Length (m)</td><td>29.0</td></tr><tr><td>Max Percolation (l/s)</td><td>127.3</td><td>Slope (1:X)</td><td>80.0</td></tr><tr><td>Safety Factor</td><td>2.0</td><td>Depression Storage (mm)</td><td>5</td></tr><tr><td>Porosity</td><td>0.30</td><td>Evaporation (mm/day)</td><td>3</td></tr><tr><td>Invert Level (m)</td><td>21.900</td><td>Membrane Depth (mm)</td><td>0</td></tr></table> Porous Car Park Manhole: S45, DS/PN: S11.000 <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Width (m)</td><td>12.8</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>1000</td><td>Length (m)</td><td>44.5</td></tr><tr><td>Max Percolation (l/s)</td><td>158.2</td><td>Slope (1:X)</td><td>50.0</td></tr><tr><td>Safety Factor</td><td>2.0</td><td>Depression Storage (mm)</td><td>5</td></tr><tr><td>Porosity</td><td>0.30</td><td>Evaporation (mm/day)</td><td>3</td></tr><tr><td>Invert Level (m)</td><td>21.100</td><td>Membrane Depth (mm)</td><td>0</td></tr></table> Porous Car Park Manhole: S47, DS/PN: S12.000 <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Max Percolation (l/s)</td><td>81.8</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>1000</td><td>Safety Factor</td><td>2.0</td></tr></table>			Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.3	Membrane Percolation (mm/hr)	1000	Length (m)	37.1	Max Percolation (l/s)	106.1	Slope (1:X)	40.0	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	25.450	Membrane Depth (mm)	0	Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	12.0	Membrane Percolation (mm/hr)	1000	Length (m)	59.8	Max Percolation (l/s)	199.3	Slope (1:X)	50.0	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	24.150	Membrane Depth (mm)	0	Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	12.0	Membrane Percolation (mm/hr)	1000	Length (m)	59.9	Max Percolation (l/s)	199.7	Slope (1:X)	50.0	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	24.050	Membrane Depth (mm)	0	Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	15.8	Membrane Percolation (mm/hr)	1000	Length (m)	29.0	Max Percolation (l/s)	127.3	Slope (1:X)	80.0	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	21.900	Membrane Depth (mm)	0	Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	12.8	Membrane Percolation (mm/hr)	1000	Length (m)	44.5	Max Percolation (l/s)	158.2	Slope (1:X)	50.0	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	21.100	Membrane Depth (mm)	0	Infiltration Coefficient Base (m/hr)	0.00000	Max Percolation (l/s)	81.8	Membrane Percolation (mm/hr)	1000	Safety Factor	2.0
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APPENDIX H

Drawings Extracted from the Site-Wide Flood Risk Assessment:

(SuDS Management Train, Site-Wide Preliminary Water Management Strategy Plan (sheet 2 of 2), Typical Layout of Strategic SuDS Features to Inform Detailed Design)

KEY



Rainfall



Interception Losses (Evapotranspiration / Infiltration)



Water Reuse



Water Quality Device (Oil Separator / Vortex Separator)



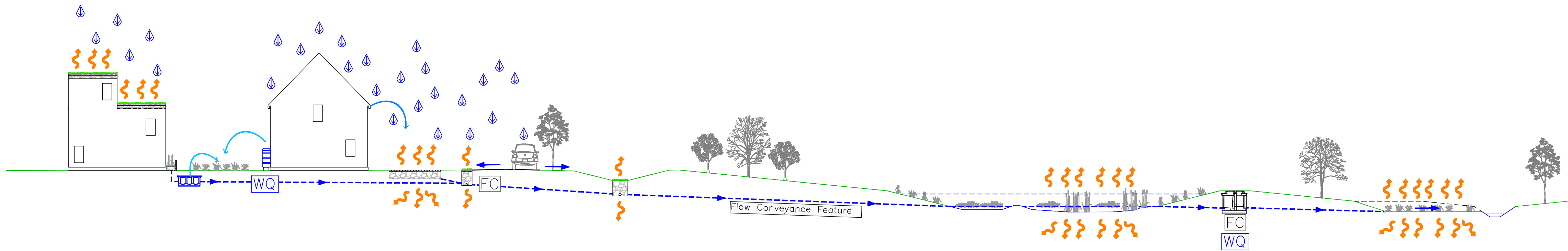
Flow Control Device (Orifice / Vortex Flow Control)



Overland Flow



Surface Water Sewer (connecting SuDS Features)



DEVELOPMENT TYPE	Commercial / Public	Residential	Private / Shared Parking	Public Highway	Conveyance Features		Green Infrastructure / Public Open Space	Watercourse Corridor
MANAGEMENT TRAIN	PREVENTION SOURCE CONTROL SITE / REGIONAL CONTROL							
SuDS FEATURE	Rainwater Harvesting (Reuse for irrigation e.g Rainwater Butts) Green Roofs Bioretention Areas / Rain Gardens Rills	Rainwater Harvesting (Reuse for irrigation e.g Rainwater Butts) Porous Paving Tanks Flow Control Devices		Swales Bioretention Areas Filter Strips Filter Drains			Strategic SuDS incorporating sediment forbays, wetland areas, micropools at the outlet Flow Control Devices Water Quality Devices	Outfall Swale
MAINTENANCE RESPONSIBILITY	Commercial or Public Tenants	Homeowners	Homeowners / Management Company	Highway Authority	Southern Water / Management Company		Southern Water / Management Company	Southern Water / Management Company



Stratton Park House, Wanborough Road
Swindon, SN3 4HG

Telephone
01793 828000

Website
www.pfaplc.com

For Planning
This drawing is produced for the purposes of supporting a planning application and should not be relied upon for tender, pricing, or construction purposes.

NOTES

- Drawing to be read in conjunction with Flood Risk Assessment and Water Management Strategy produced by PFA Consulting (Document Ref: G277-DOC01 Dated November 2020) and Preliminary Water Management Strategy Plan (Drawing No. G277/21 & 22).
- Future design of upstream Source Control & Site Control to take account of the principles established in the Water Management Strategy and this drawing.

Rev	Date	Description	Drawn	Check
#	26.11.20	First Issue.	BF	MWS

Status
FOR PLANNING

Client
Eastleigh Borough Council

Project
**One Horton Heath
Hampshire**

Drawing Title
SuDS Management Train

Drawing No. **G277/24**

Date: November 2020 Scale: NTS @ A1
E-Mail: bfox@pfaplc.com

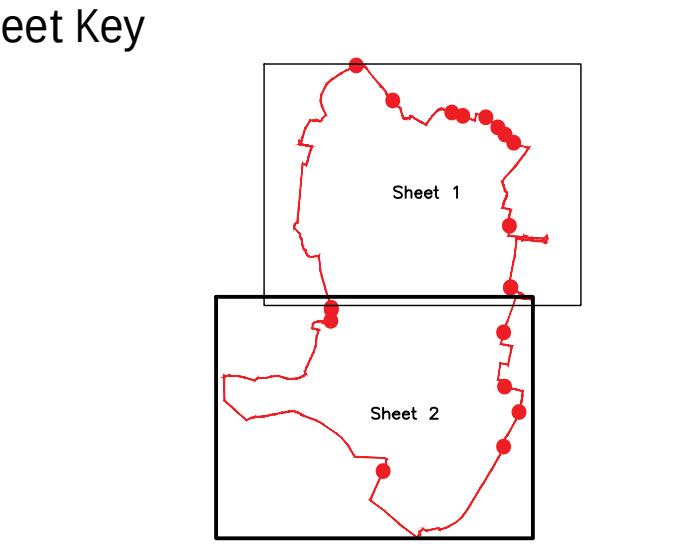


Strategic SuDS Features Schedule							
Strategic SuDS Feature	Contributing Catchment (ha)	% of impermeability	Q ₁₀₀ for Catchment (l/s)	1 in 1 Year Storage Volume (m³)	1 in 1 Year Resulting Discharge (l/s)	1 in 100+40%CC Storage Volume (m³)	1 in 100+40%CC Resulting Discharge (l/s)
A	2.037	65	18.4	165	17.8	802	18.3
	0.260	100					
B	3.750	65	30.0	260	28.1	1224	29.9
C	6.808	65	54.5	405	50.1	2172	54.4
D	3.381	65	27.1	244	23.7	1112	27
E	3.650	65	32.3	337	24.8	1706	32.3
	0.382	100					
F	3.360	65	26.9	241	23.9	1103	26.9
G	2.762	65	41.5	267	34.7	1450	40.3
	2.415	50					
H	1.603	30	70.8	683	44.1	2694	70.8
	0.409	100					
I	6.831	65	29.6	314	26.7	1339	28.7
	1.556	65					
J	2.139	65	13.6	127	11.0	560	13.5
K	1.696	65	39.6	433	32.5	1860	39.5
	3.894	65					
L	1.046	100	17.7	156	16.2	728	17.7
M	2.213	65	46.1	477	31.1	1924	46.0
N	5.759	65	16.3	150	15.5	878	16.3
EM(Employment)	2.029	85					

For Planning
This drawing is produced for the purposes of supporting a planning application and should not be relied upon for tender, pricing, or construction purposes.

- NOTES**
- This drawing should be read in conjunction with PFA Consulting's Flood Risk Assessment (Doc ref: G277-DOCD1 FRA - Issue 1) dated Dec 2020.
 - This drawing is based on the Topographical Survey undertaken by Mayer Brown Limited, Drawing No:IR.SAV.1.21.1, Rev E, dated 05 May 2014.
 - This site layout is based on Thrive's Concept Masterplan, Drawing number EAST200403 CMP 01 Rev P13, dated 04.12.20
 - Main River designation based on Flood Map for Planning.
 - All SuDS features shown on this drawing are subject to detailed design.
 - Typical Layout of Strategic SuDS Features to Inform Detailed Design shown on drawing number G277/23.
 - Detailed design of highway drainage features to provide attenuation and restrict flow to the downstream watercourse system. Sufficient attenuation should be provided to ensure discharge rates are restricted for all return periods up to the 100 year design event, including an appropriate allowance for climate change. Refer to PFA's Flood Risk Assessment (dated Dec 2020) document for guidance on flow rate restrictions.

- Key**
- Risk of Flooding from Surface Water Outfall
 - Basin Catchment Allocation
 - Flood Zone 2
 - Flood Zone 3
 - Indicative Location of Foul Water Sewage Pumping Station with 10m clear offset
 - 5m offset from Watercourse
 - 5m offset from Main Rivers
 - Opportunity for scale conveyance feature
 - Direction of Excessance Flows
 - Outlet from SuDS Feature to be conveyance swale where feasible
 - Indicative Proposed Foul Rising Main
 - Indicative Proposed Strategic Foul Sewer
 - Indicative Foul flow direction



Rev	Date	Description	Drawn	Check
#	27/11/20	First Issue	DAB	WVG
A	11/12/20	Revised to latest Masterplan & link road design	DAB	SAM

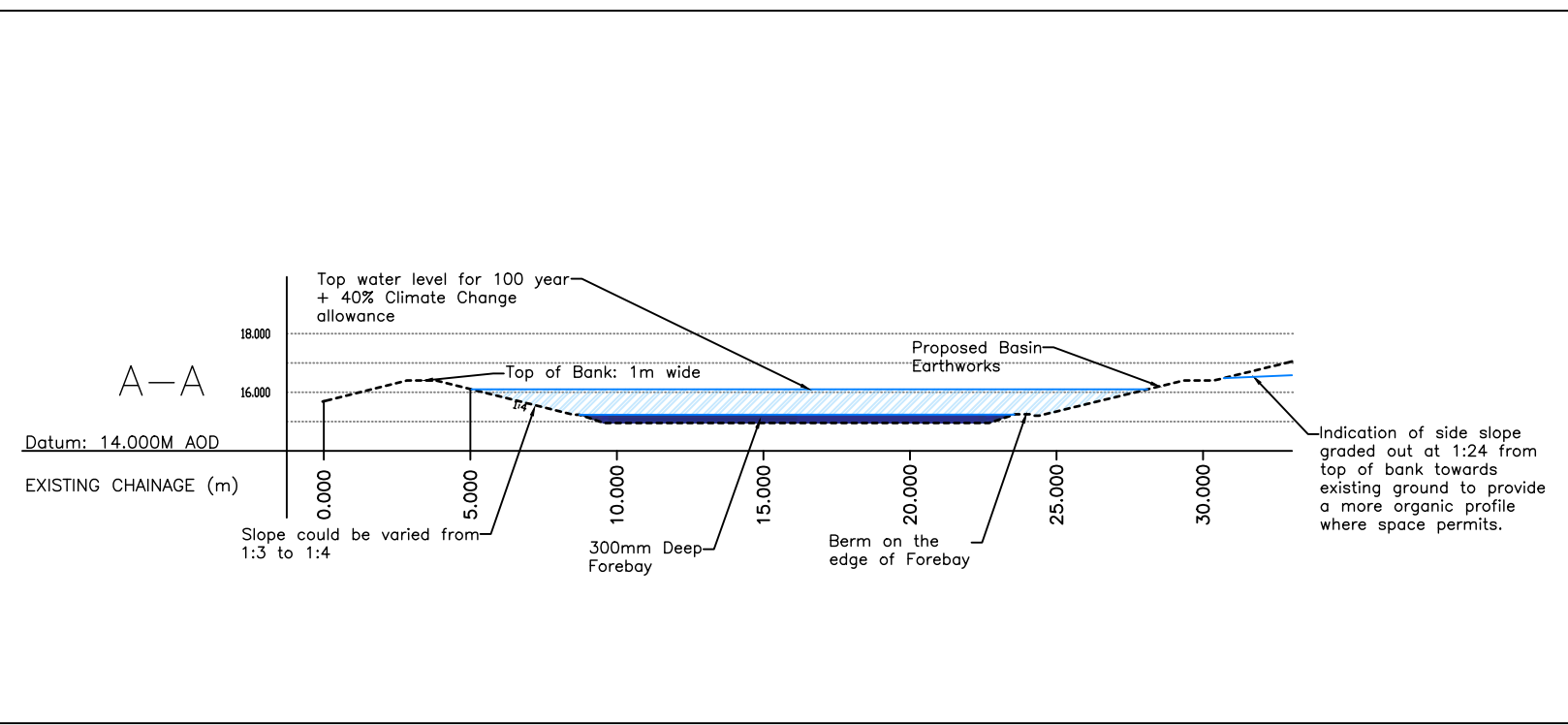
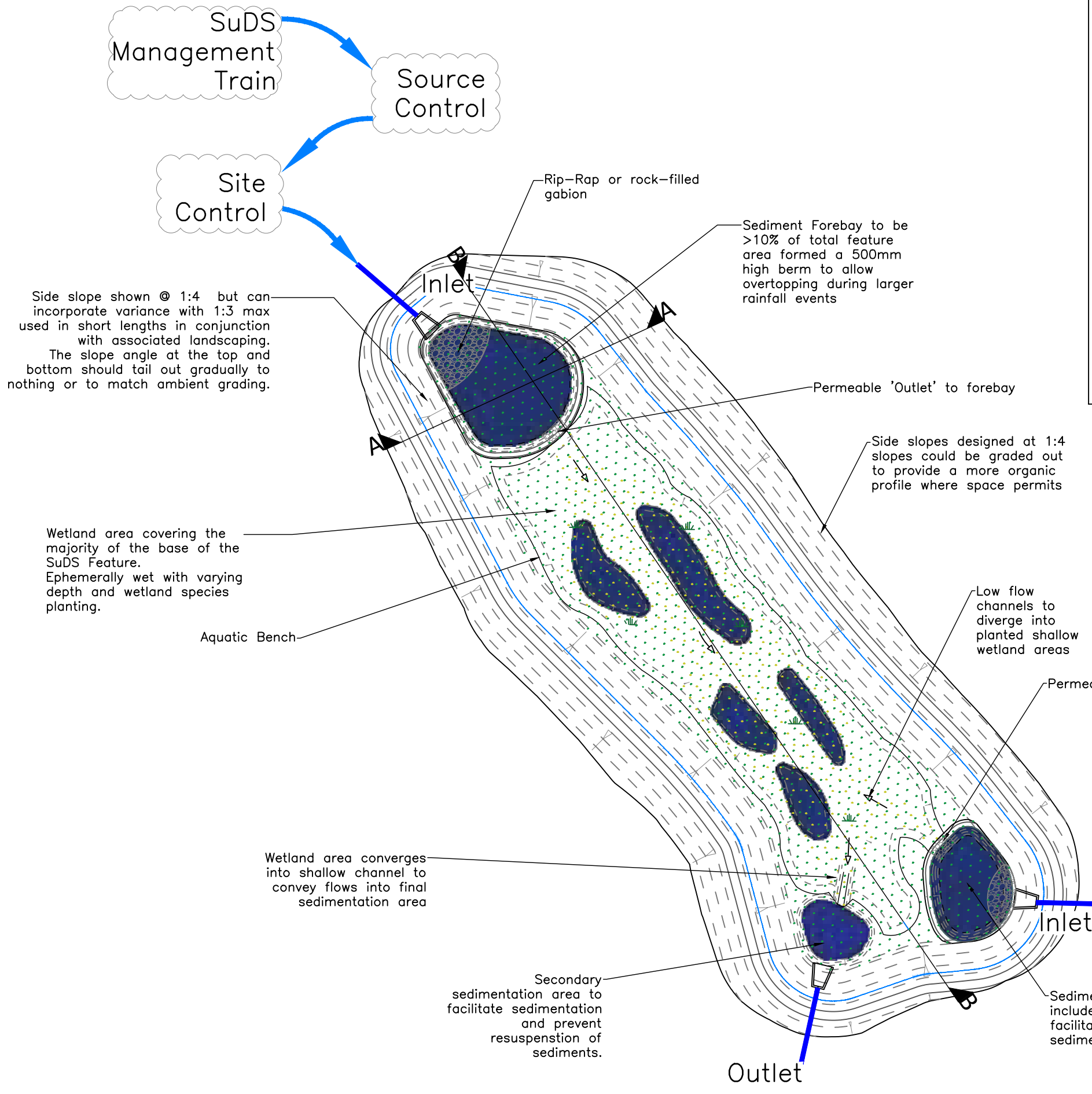
Status
FOR PLANNING

Client
Eastleigh Borough Council

Project
**One Horton Heath
Hampshire**

Drawing Title
**Preliminary Water
Management Strategy Plan
(Sheet 2 of 2)**

Drawing No. **G277/22** Rev A
Date: November 2020 Scale: 1:1250 @ A0
E-Mail: DBuciak@pfapl.com



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For Planning
This drawing is produced for the purposes of supporting a planning application and should not be relied upon for tender, pricing, or construction purposes.

- NOTES**
1. This drawing shows the typical SuDS feature arrangements for the SuDS features shown on the Preliminary Water Management Strategy Plan, Drawing number G277/21 & G277/22.
 2. Upstream SuDS management train principles are outlined in the PFA's Water Management Strategy and depicted on drawing G277/24 dated November 2020.

Rev	Date	Description	Drawn	Check
#	26/11/20	First Issue.	DAB	SAM

Status

FOR PLANNING

Client

Eastleigh Borough Council

Project

**One Horton Heath
Hampshire**

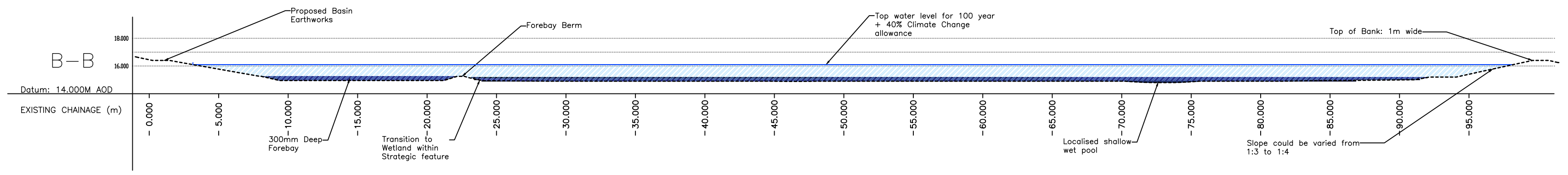
Drawing Title

**Typical Layout of Strategic
SuDS Features to Inform
Detailed Design**

Drawing No.

G277/23

Date: November 2020 Scale: As shown
E-Mail: DBuciak@pfapl.com



APPENDIX I

Maintenance Schedules

TABLE 17.1 Operation and maintenance requirements for swales

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly, or as required
	Cut grass – to retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for > 48 hours	Monthly, or when required
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly
Occasional maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed over 10% or more of the swale treatment area
Remedial actions	Repair erosion or other damage by re-turfing or reseed	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

TABLE 20.15 Operation and maintenance requirements for pervious pavements

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Many of the specific maintenance activities for pervious pavements can be undertaken as part of a general site cleaning contract (many car parks or roads are swept to remove litter and for visual reasons to keep them tidy) and therefore, if litter management is already required at site, this should have marginal cost implications.

Generally, pervious pavements require less frequent gritting in winter to prevent ice formation. There is also less risk of ice formation after snow melt, as the melt water drains directly into the underlying sub-base and does not have chance to refreeze. A slight frost may occur more frequently on the surface of pervious pavements compared to adjacent impermeable surfaces, but this is only likely to last for a few hours. It does not happen in all installations and, if necessary, this can be dealt with by application of salt. It is not likely to pose a hazard to vehicle movements.

► Generic health and safety guidance is presented in **Chapter 36**.

CDM 2015 requires designers to ensure that all maintenance risks have been identified, eliminated, reduced and/or controlled where appropriate. This information will be required as part of the health and safety file.

TABLE 22.1 Operation and maintenance requirements for detention basins

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly
	Cut grass – for spillways and access routes	Monthly (during growing season), or as required
	Cut grass – meadow grass in and around basin	Half yearly (spring – before nesting season, and autumn)
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly
	Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Monthly (for first year), then annually or as required
	Check any penstocks and other mechanical devices	Annually
	Tidy all dead growth before start of growing season	Annually
	Remove sediment from inlets, outlet and forebay	Annually (or as required)
	Manage wetland plants in outlet pool – where provided	Annually (as set out in Chapter 23)
Occasional maintenance	Reseed areas of poor vegetation growth	As required
	Prune and trim any trees and remove cuttings	Every 2 years, or as required
	Remove sediment from inlets, outlets, forebay and main basin when required	Every 5 years, or as required (likely to be minimal requirements where effective upstream source control is provided)
Remedial actions	Repair erosion or other damage by reseedling or re-turfing	As required
	Realignment of rip-rap	As required
	Repair/rehabilitation of inlets, outlets and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required

22.13 REFERENCE

KENNARD, M F, HOSKINS, C G and FLETCHER, M (1996) *Small embankment reservoirs*, R161, CIRIA, London, UK (ISBN: 978-0-86017-461-5). Go to: www.ciria.org

Statutes

Reservoir Act 1975 (c.23)

Health and Safety at Work (etc) Act 1974 (c.37)

Building Act 1984 (c.55)

Flood and Water Management Act 2010 (c.29)

Construction (Design and Management) Regulations (CDM) 2015

TABLE 14.2 An example of operation and maintenance requirements for a proprietary treatment system

Maintenance schedule	Required action	Typical frequency
Routine maintenance	Remove litter and debris and inspect for sediment, oil and grease accumulation	Six monthly
	Change the filter media	As recommended by manufacturer
	Remove sediment, oil, grease and floatables	As necessary – indicated by system inspections or immediately following significant spill
Remedial actions	Replace malfunctioning parts or structures	As required
Monitoring	Inspect for evidence of poor operation	Six monthly
	Inspect filter media and establish appropriate replacement frequencies	Six monthly
	Inspect sediment accumulation rates and establish appropriate removal frequencies	Monthly during first half year of operation, then every six months

should be undertaken whenever access for maintenance is required. Removal of oil, silt and other pollutants must be in accordance with the appropriate waste management legislation.

Maintenance responsibility for all systems should be placed with an appropriate organisation, and Maintenance Plans and schedules should be developed during the design phase.

- Further detail on the preparation of maintenance specifications and schedules of work is given in **Chapter 32**.

Table 14.2 provides guidance on the type of operation and maintenance schedule that may be appropriate for a proprietary treatment system. The list of actions is not exhaustive and some actions may not always be required.

CDM 2015 requires designers to ensure that all maintenance risks have been identified, eliminated, reduced and/or controlled where appropriate. This information will be required as part of the health and safety file.

- Generic health and safety guidance is presented in **Chapter 36**.

14.12.2 Oil water separators

Specific requirements for oil/water separators are provided in PPG3 (EA/SEPA/EHSNI, 2006). The following items should be undertaken every six months as a minimum:

- check volume of sludge
- check thickness of light liquid
- check function of automatic closure device
- empty the separator, if required
- check the coalescing material and clean or change if necessary (class 1 only)
- check the function of the warning device (if fitted)

General inspection of the integrity of oil/water separators should occur at a maximum frequency of five years, and should cover the following:

- watertightness of system